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JAN 78 G E GOWINS, H T JACKSON
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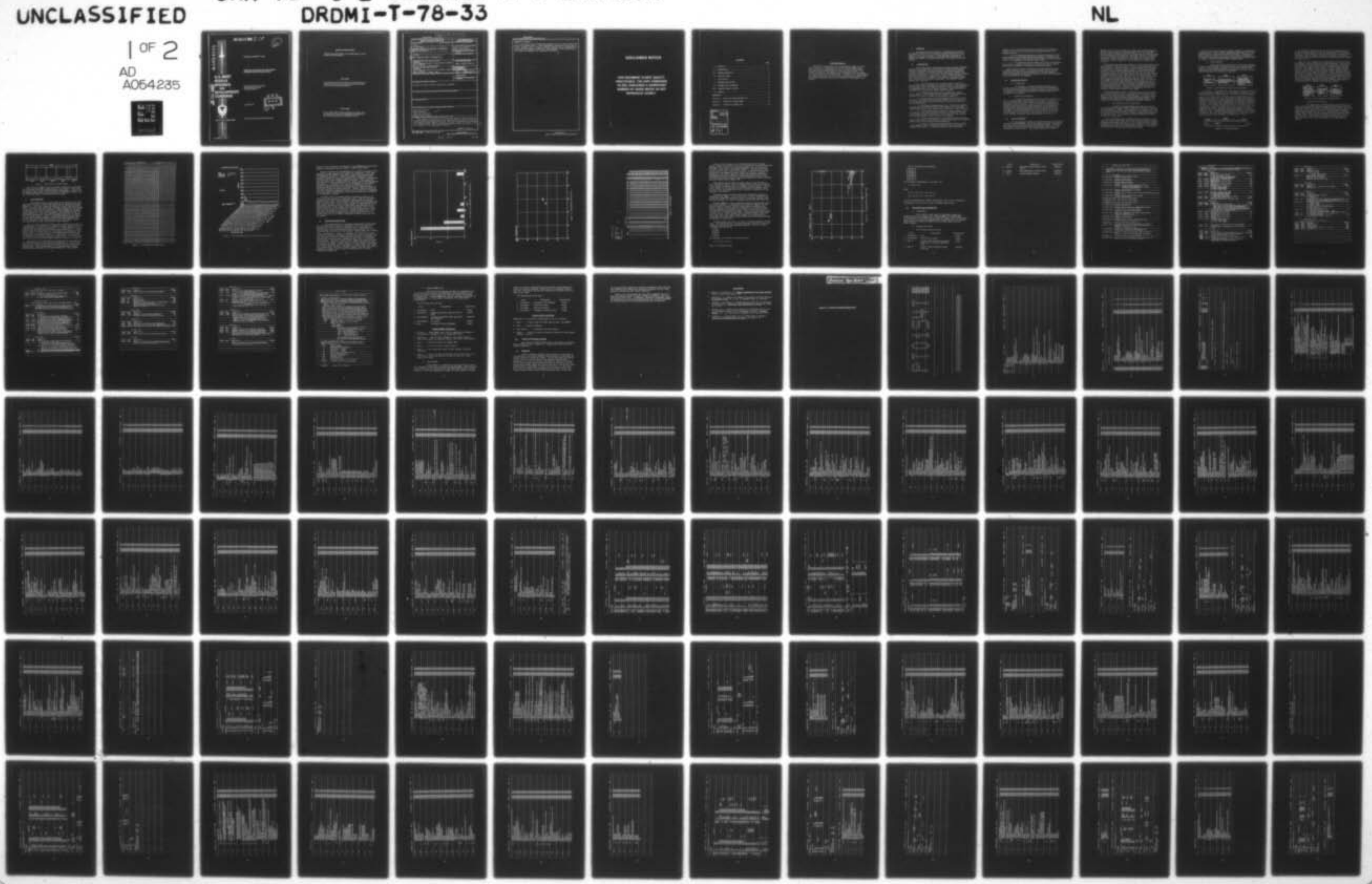

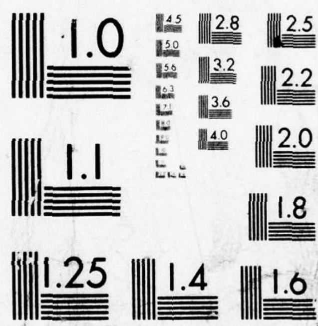

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COMPUTER SOFTWARE FOR ANALYSIS OF INFRARED TARGETS AND CLUTTER

Gene E. Gowins and H. Tracy Jackson
Advanced Sensors Directorate
Technology Laboratory

JANUARY 1978

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U.S. ARMY MISSILE RESEARCH AND DEVELOPMENT COMMAND

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This report is the second in an anticipated series of progress reports on target/background modeling related to the US Army Missile Research and Development Command's Target Signature Program. This report describes data collection and computer software used to characterize infrared targets and clutter in the 3- to 5-μm and 8- to 14-μm infrared spectrum.

ABSTRACT (Continued)

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ABSTRACT (Continued)

A raster type scanner Thermovision system is used to collect 10,000 data points per infrared picture. These Thermovision data points provide input to several different types of computer software routines used to investigate and evaluate passive infrared targets and clutter signatures and identify potential target discrimination and acquisition techniques.

CONTENTS

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I. OBJECTIVE

The objective of this report is to describe data collection and computer software used to characterize armored targets and ground clutter in the 3- to 5-μm and 8- to 14-μm infrared (IR) spectrum. The software is designed to evaluate a conceptual seeker algorithm for effectiveness against an armored threat within the threat's operational scenario.

II. INTRODUCTION

The US Army Missile Research and Development Command (MIRADCOM) Advanced Sensors Directorate is conducting a Ground Target Signatures Program to investigate and evaluate passive IR targets and background (clutter) signatures and identify potential target discrimination and acquisition techniques. To these ends, several computer software routines have been developed which progress from a point of producing graphics which provide intuitive insight into the problem to qualitative evaluation of detection and acquisition algorithms. The computer software features are as follows:

a) Three-dimensional plot of target-clutter energy versus aspect position with a subroutine to convert the data to a two-dimensional plot of energy versus scan direction position — This is accomplished by an integration process in the vertical dimension. These data provide information for scan direction Weiner Spectrum analysis.

b) Two-dimensional matrix plot of energy versus target clutter position — This program provides a matrix of data values versus position to be used in a simple hot spot detection algorithm.

c) Target-clutter noise discrimination model used to vary a threshold on the matrix array provided in Routine b) — The program output is the number of data points exceeding the threshold and the location of those points.

d) Histogram of target-clutter scene. This routine generates an energy probability density function which can be used to evaluate target energy versus clutter energy and the setting of a seeker threshold.

e) Variable field-of-view (FOV) scan — This program is used to subdivide a large array of data into smaller increments as would be seen by a matrix array of detectors or a line array with scan direction data storage equivalent to the vertical scan dimension.

f) Fly-in simulation model — This program selects consecutive subsets of the original data matrix to simulate the reduced FOV encountered during seeker fly-in and calculates data statistics.

g) Graphics target-clutter frame-to-frame comparison model—— This program is used to accumulate statistics over a large number of scenes as in Routine d). It then calculates the mean and standard

deviation of the accumulated scenes and uses Routine c) to evaluate a threshold set to the scene mean value plus integer multiples of the standard deviation.

h) Two-dimensional gradient and spatial discriminator — This program generates a two-dimensional thermal gradient by evaluating the pixel to pixel changes in both horizontal and vertical directions through the use of a 2-horizontal by 2-vertical pixel window.

i) Two-dimensional thermal gradient and spatial discriminator— This routine is identical to Routine h) except for the window function which has been expanded to 3-horizontal by 3-vertical pixels.

These routines are used in conjunction with AGA Thermovision data to evaluate tactical scenes. The following sections provide the AGA thermovision raw data and data formating into a CDC 6600 compatible format, a mathematical and physical description of each computer program, and a users guide for each program.

III. PROBLEM DEFINITION

A. Introduction

The evaluation of seeker performance against armored threats requires a thorough understanding of the seeker *algorithm and* the nature of the threat and its expected environment. Once this basis is established, more sophisticated methods of target-background discrimination can be applied.

B. System Characterization

The first step which must be taken in any computer evaluation is characterization of the system to be analyzed. To do this, either the target must be characterized by some model or actual field measurements must be obtained. A model is usually a tradeoff between accurate representation of the target-background and the mathematical complexity which the analytic system can handle. Field measurements are real-world situations limited only by the similarity of the data acquisition system to possible seekers and by the number and variety of measurements that can be made. Once the data are collected, they can be analyzed on numerous levels from intuitive to analytical.

IV. DATA COLLECTION

The data collection system is a raster type scanner manufactured in Sweden by AGA AKTIEBOLAG. The system contains two major subassemblies; the camera head and an electronics control/display console. The camera head consists of a silicon lens with a 134-mm focal length and a maximum aperture opening of f/1.5. The optical system uses a variable

aperture stop to control the FOV and an image plane scanner designed to produce a raster scan at 16 frames/sec over a 10° by 10° square FOV. The scan rate is determined by the 280 vertical line 2/1 interlace raster with 140 unambiguous data points per horizontal line and 140 unambiguous vertical line resolution capability. The single detector is an InSb photovoltaic detector operating at 77°K by means of a nitrogen dewar. The detector angular subtense for both horizontal and vertical FOV is 1.3 mrad.

The detected video signal is supplied to the video amplifying circuits which amplify and filter the signal to drive a small cathode ray tube which generates a pictorial result. At the same time, the video signal is supplied to an analog-to-digital converter. The analog-to-digital converter presently digitizes approximately one frame per second and stores data serially in a PCM format on one track of a 14-track tape on an AMPEX-1300 tape recorder. Each digitized data frame consists of 140 vertical lines with 140 data points per line in a 10-bit word for each data point. This 14-track output tape, with one track of serially packed digitized Thermovision output data contains 140 × 140 × 10 bits of information for each frame digitized. This information is then selected on a per frame basis and recorded on a digital parallel seven-track tape compatible with input data format requirements of an Army CDC-6600 digital computer. Further and more detailed descriptions of recording techniques and the reduction of Thermovision data will be addressed in the ensuing sections of this report.

The AGA Thermovision system is relatively small and may be mounted on a helicopter, elevated tower, or installed in a fixture at ground level to view a ground target or background scene. In support of many different air defense and ground target signature applications, the system has been equipped with eight different bandpass filters. Each of these filters represents an IR bandpass of military interest.

A. AGA Thermovision Field Measurements

In general, the AGA Thermovision system has been used in IR measurements of ground targets viewed from both ground level positions and elevated platforms. This system of data collection has proven to be reliable in many and varied applications. For example, this system has been used by the Air Force to record in-flight IR signatures of jet aircraft plumes. The Thermovision system was mounted in a pod on the wing of a chase plane.

For the current application, the Thermovisions were mounted on a helicopter to collect ground target and clutter data from various altitudes, ranges, and aspect angles near vertical. Due to the interaction between the target and ground clutter and a desire to gain more of an intuitive insight into the problem and evaluate seeker concepts, a large quantity of data has been taken for ground targets and clutter.

Data of these types, along with computer analysis, can evaluate and establish limits on seeker systems acquisition techniques which operate predominately on energy levels and spatial frequency. These types of data and computer analyses can also be used to assess the feasibility of automatic target cueing technology in detecting and recognizing tactical targets in forward looking IR (FLIR) imaging systems.

B. Data Formatting

The purpose of this section is to outline steps required to process and reduce the raw Thermovision data to a computer compatible format. The block diagram of Figure 1 will be used to describe the required process from the point of data inception to the point of inputting reduced data to the CDC-6600 for analysis.

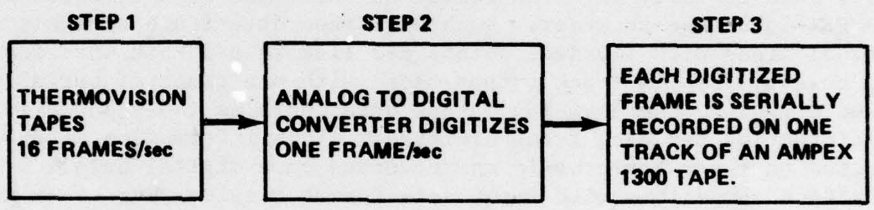

Figure 1. AGA Thermovision data recording process.

During Step 1, each Thermovision data frame is composed of 140 lines with 140 resolution elements per line; consequently, if each data point is represented with a 10-bit word ($16 \times 140 \times 140 \times 10$ bits of information), the string of 3.136×10^6 bits/sec would require recording on magnetic tape. This data rate is well beyond the tape drive operating capability; therefore, an analog-to-digital converter was developed to digitize one frame per second, approximately 196,000 bits of information per frame. This requires the matching of lines from frame to frame to reconstruct one frame out of every 16 frames. To assure correct frame reconstruction, the last two data points at the end of each frame have a special coded value. Therefore, at the end of Step 3, a 14-track AMPEX-1300 tape is generated with digital PCM Thermovision information on only one track. A physical representation of the one track is shown in Figure 2. Each line is composed of Data Point 1 (D1) through Data Point 140 (D140); each data point is represented by 10 bits.

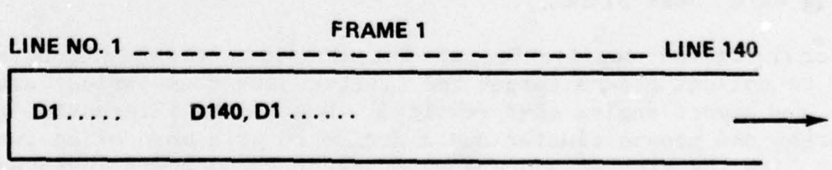

Figure 2. Data frame format.

For each line, Data Points 139 and 140 have the same special bit pattern to denote the end of a line; in addition, Data Points 139 and 140 of Line 140 are made up of a special bit pattern to identify the end of a frame. After one frame is recorded on the tape, a new frame is started; this process repeats itself until the measurements are completed or a tape is full.

Steps 4, 5, and 6 (Figure 3) are illustrated to show how the data are recorded to meet CDC-6600 input format requirements. During Step 4, a decommutator is used to select the correct coded words at the end of each line and at the end of each frame to reconstruct each data frame correctly. Each frame of data is input to a PDP-11 digital computer (Step 5). During Step 6, a PDP-11 digital computer takes the serial string of bits and generates a seven-track parallel digital packed tape which may be input to a CDC-6600 computer. It must be recalled that a 10-bit word was output from the analog to digital converter to represent each 10-bit data point. This 10-bit word is now right-adjusted in each of the 18-bit words output from the PDP-11 computer. Thus, at the end of Step 6, a magnetic digital tape composed of Thermovision data has been generated and is compatible with CDC-6600 software.

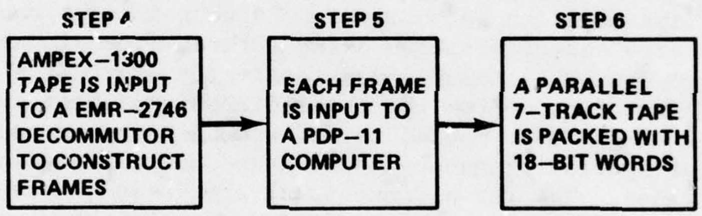

Figure 3. Data conversion to CDC-6600 format.

C. Validation of Data Format

The initial task in the Thermovision data analysis is to input to the Eglin BASES program the digital tape generated during the previously mentioned six steps of the data reduction process. The 10-bit input data are now contained in an 18-bit word and must be selected, sorted, and shifted into a 60-bit word. After processing through the BASES program's GETPIC routine, a new seven-track parallel data tape is created, which is made up of 60-bit words, with five 12-bit words in each 60-bit word. Furthermore, the 10 bits of meaningful data are packed in each of the 12 bits of information as in the example of Figure 4.

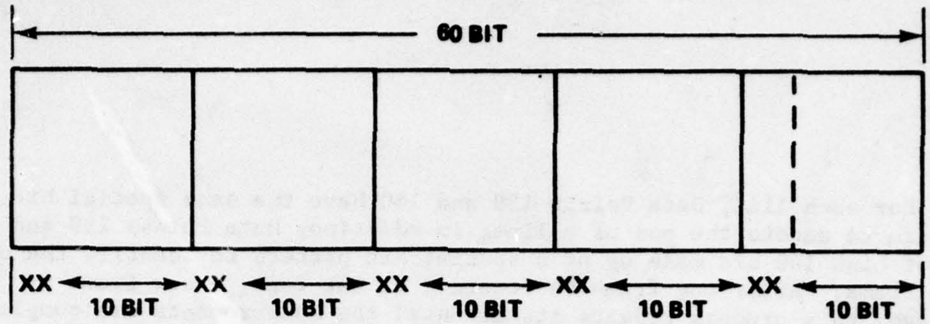

Figure 4. CDC 60-bit word data format.

After using the GETPIC routine one time to generate the new 60-bit word data tape, the BASES program may be run any number of times with the new data tape without using the GETPIC routine again. Outputs from the BASES program applied to measured data are tabulated in Table 1 for 100 of the 260 frames of data contained on the tape.

V. DATA ANALYSIS

The simplest level at which data can be analyzed is by a two-dimensional printout of data counts versus the two spatial coordinates (Figure 5). This gives a quick intuitive feel for the general distribution of energy in the data frame. Maximum, minimum, and rough average energy across the data can be obtained. Further insight can be gained by plotting energy versus position using a three-dimensional plotting program (Figure 6). This three-dimensional plot provides a wealth of qualitative information. From the three-dimensional plot, an evaluation of target energy as compared to background energy can be obtained. A rough idea of spatial frequency content and thermal gradients can also be determined. The three-dimensional plot also quickly reveals the distribution of equal energy levels (level slicing).

From this point, there are basically three different approaches to target-background discrimination: spatial filtering, feature selection-classification, and pattern recognition [1]. Spatial filtering can be achieved most easily by scanning with an array of detectors. A linear array of detectors whose output is summed while being scanned at right angles across a scene will produce a one-dimensional distribution of energy versus scan position (Figure 6). This output can be converted to a Weiner spectrum using the Fourier transform [2]. The Weiner spectrum can then be used to characterize target and background signatures.

The importance of characterizing IR backgrounds is unquestionable, but methods for doing so have been hotly debated [2-5]. Most recent efforts have centered around modeling IR backgrounds as Gaussian noise distributions. Such distributions can then be described by Weiner spectra, autocorrelations, or line scan distributions. Thus, the main

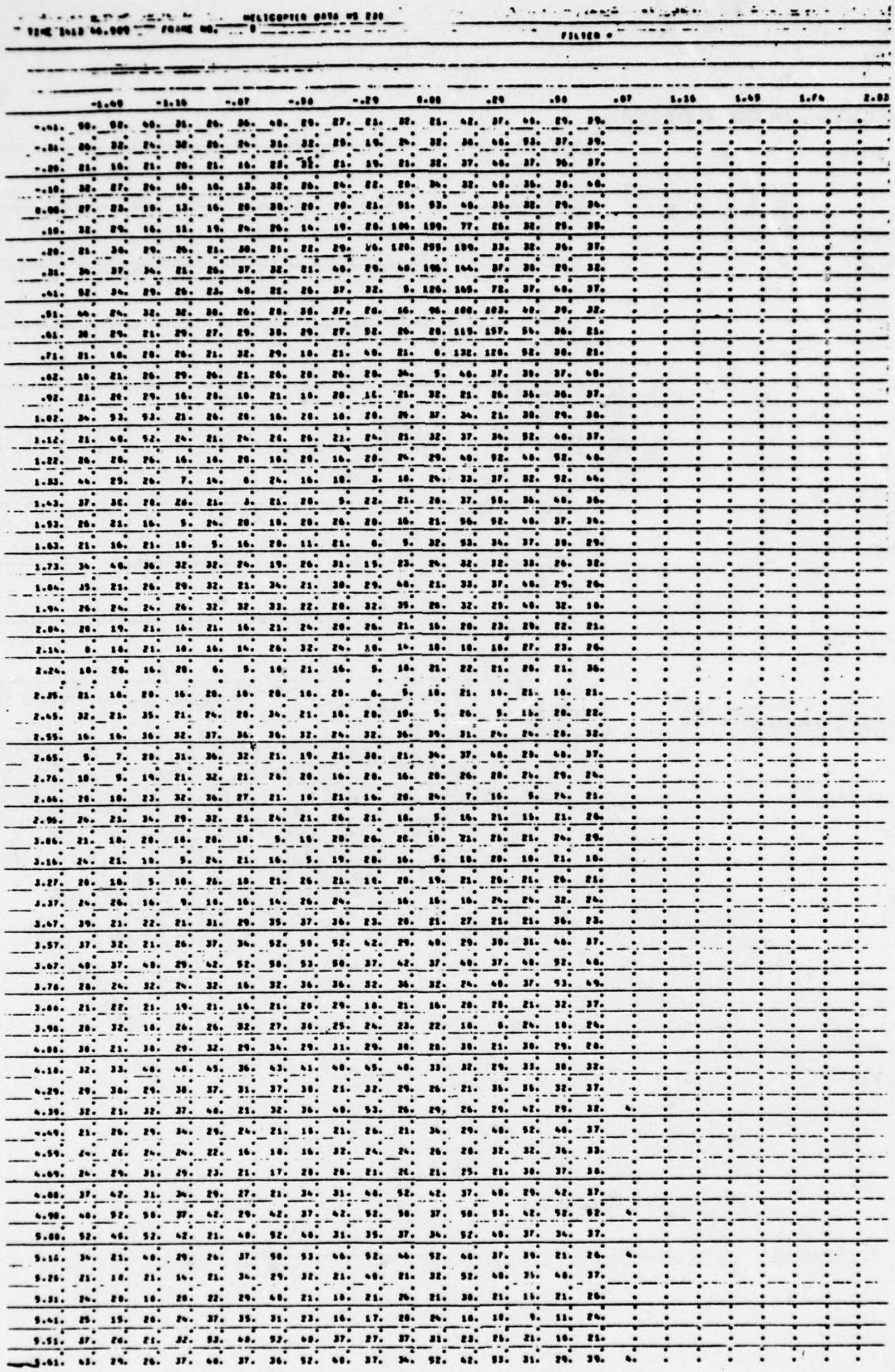

Figure 5. Two-dimensional matrix plot.

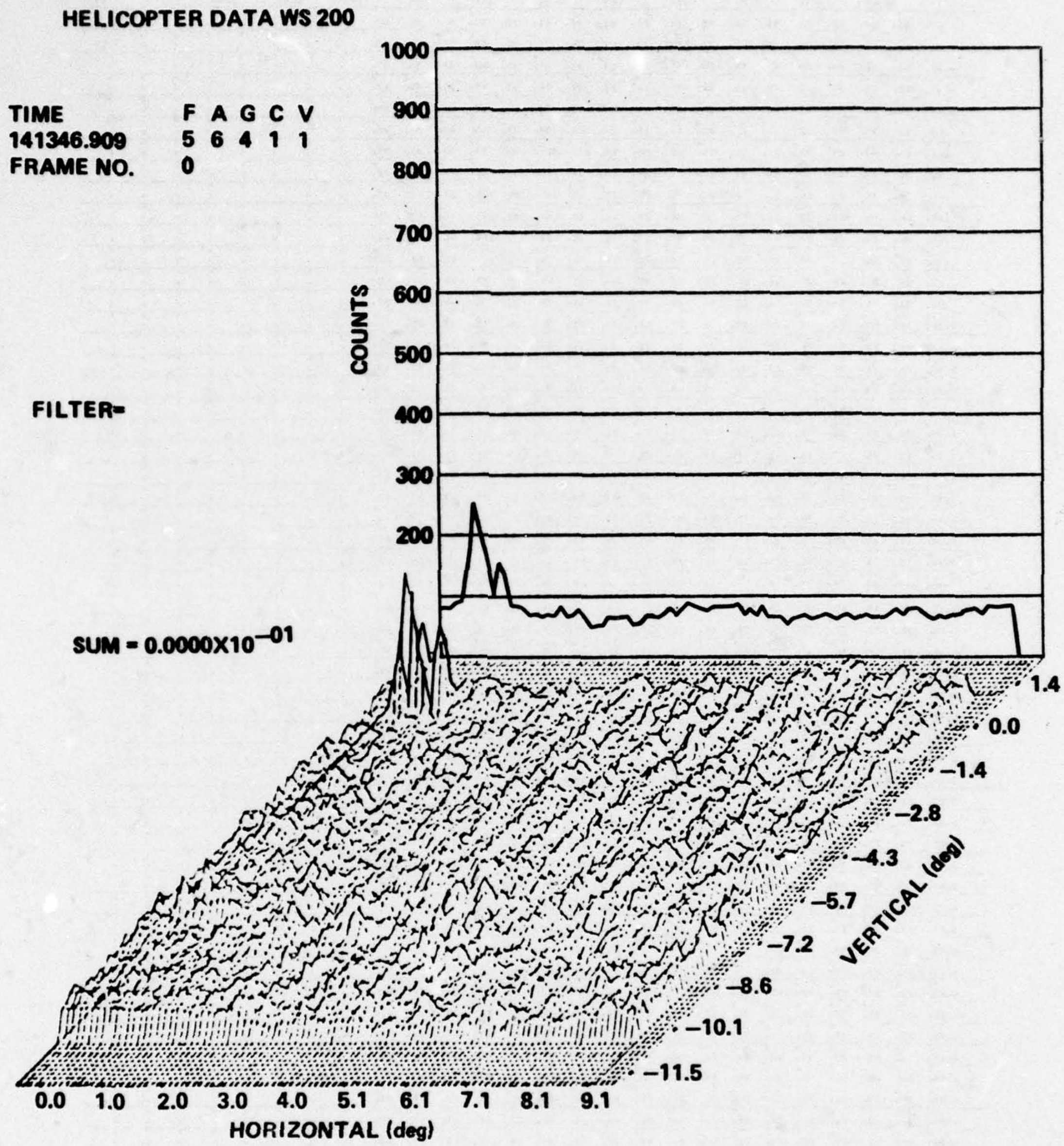

Figure 6. Three-dimensional plot with vertical scan plot.

thrust of data acquisition and analysis of the MIRADCOM IR ground target signatures program has been to confirm or refute these models.

Feature selection and classification also requires knowledge of the statistical energy signatures of targets and backgrounds. To do this, a histogram of the number of data points versus scene intensity must be accumulated (Figure 7). From the histogram (probability density function), target and background signatures can be fitted to statistical distributions, usually assumed normal or Gaussian. These statistics will then define error probabilities for various seeker-target-background combinations. A qualitative feel for the performance of an adaptive-threshold seeker algorithm can be gained by thresholding the two-dimensional matrix plot around the target mean at integer multiples of the target standard deviation (Figure 8). Further characterization of target and background signatures requires that statistics be accumulated on a large number of data frames to increase the statistical confidence in the signatures obtained.

The first step in performing pattern recognition studies is to define the shapes present in a particular scene. This is most easily accomplished by spatial differentiation, which essentially enhances edges of objects (this is also useful in evaluating the performance with edge tracker systems). There are many methods for edge enhancement but the simplest computationally are linear matrix approximations to the spatial gradient. These methods involve using either a two by two or three by three matrix as a window for calculating differences in absolute value among adjacent data points. Matrix windowing also allows simulation of various configurations of shaped detector arrays. By altering the size of the matrix, simulation of seeker fly-in can also be achieved.

VI. SOFTWARE DESCRIPTIONS

The program P2171 is a versatile package which provides many alternate methods to display the information in a particular scene. The program provides options to enable the user to read packed or unpacked data. Various operational modes can be selected due to the compartmentalized structure of the program. Energy levels can be output either uncalibrated as counts, or calibrated in $W\ cm^{-2} str^{-1}$ by using previously determined calibration constants and various parameters read from the input data tape. Coordinates can be output in three modes: uncalibrated (row and column), calibrated linear (ft), or calibrated angular (deg). Provision is made in this program for editing the data to decrease the effects of noise spikes or delete obviously bad data. The program can output a summary (Figure 9) of each frame of data which includes the following data: time before and after frame, time difference, frame number, instrument settings (filter, aperture, gain, etc.) maximum and average counts, location of maximum count, and other internally related data.

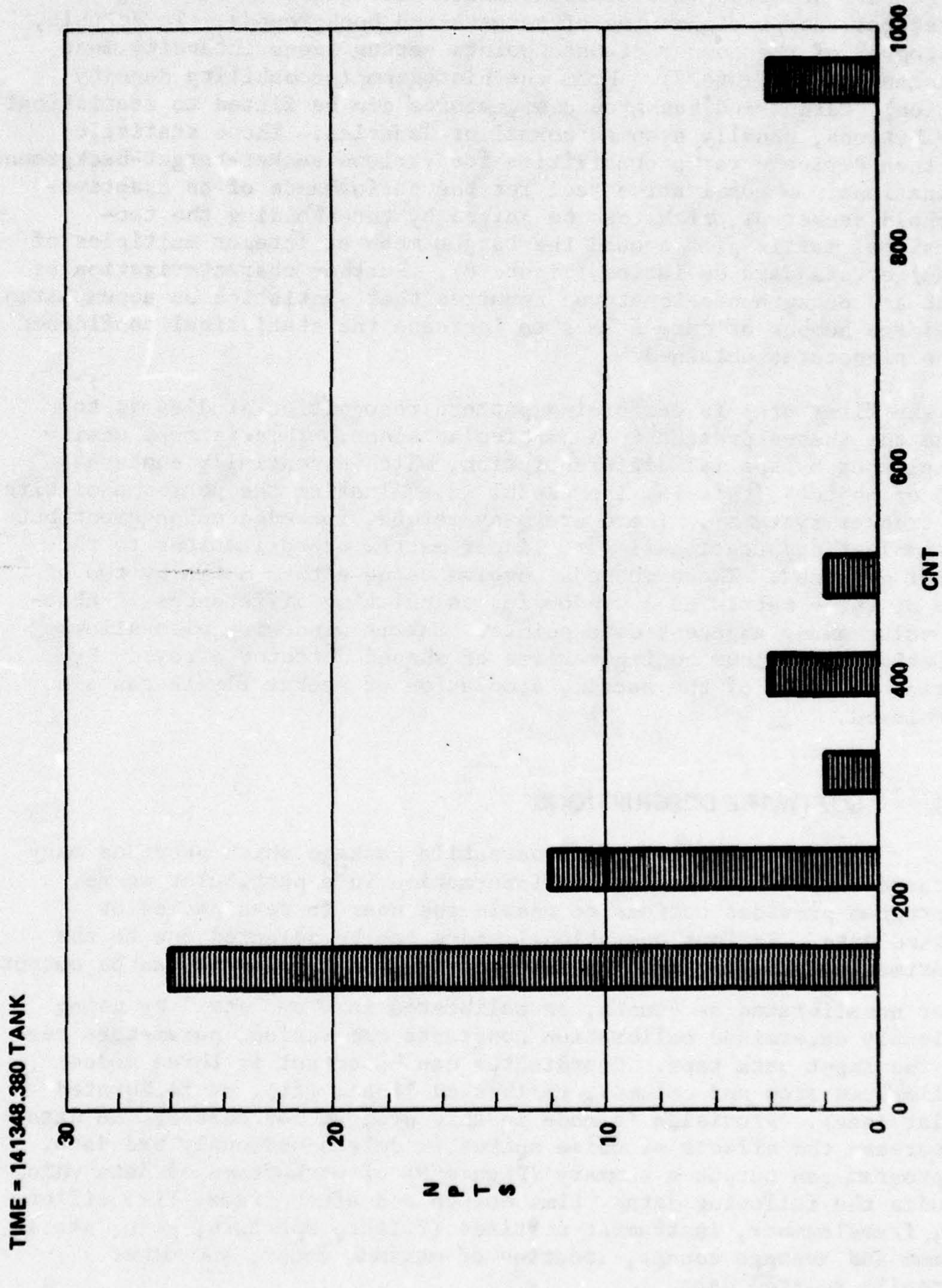

Figure 7. Histogram of probability density function.

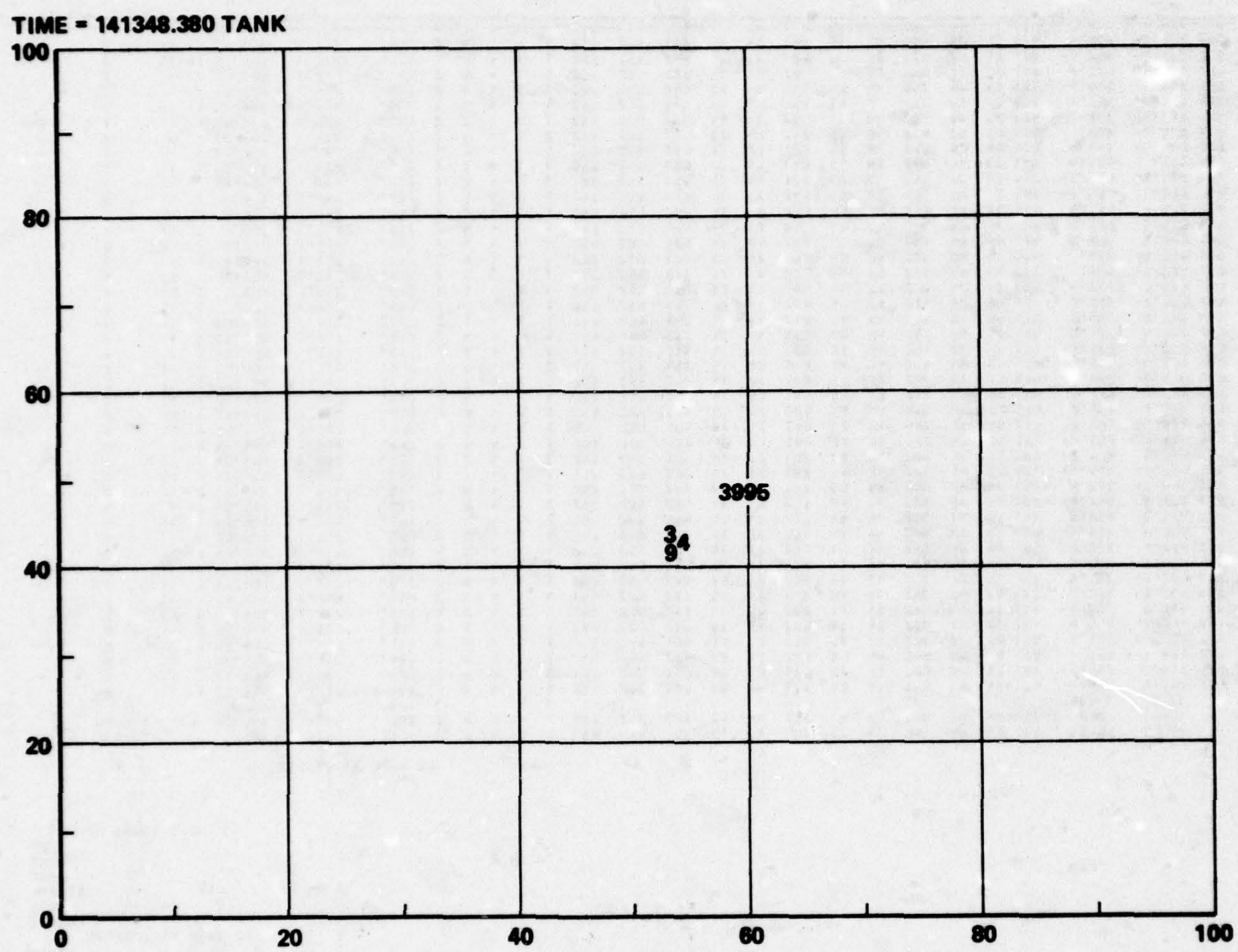

Figure 8. Thresholded matrix plot.

BEGINNING OF INPUT DATA

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TRACK     -2
PLOT      01        01
MATRIX    01        01          -6.1
TAPE      02
EDIT                                         2.3
GO
   END OF INPUT DATA
```

HELICOPTER DATA B3

FRAME NUMBER			TIME BEFORE PICT	TIME DIFF	TIME BET PICT	FIL	AP	GV	CAL	VAL	LTM BEF	LTM AFT	C1 CNT	C1 LN	C1 HD	C2 CNT	C2 LN	C2 HD	MAX CNT	MAX LN	MAX HD	AVG CNT	AZ OF MAX CELL	EL OF MAX CELL	
0	11	2	25.816	1.312	*********	2	6	4	1	1	255	255	165	41	24	176	62	67	190	36	41	130	-.480	4.340	256
0	11	2	27.191	1.312	.062	2	6	4	1	1	255	255	202	40	3	186	60	53	208	39	22	129	-2.367	3.043	105
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0	11	3	13.924	1.312	.062	2	6	4	1	1	255	255	188	60	22	192	56	64	232	90	92	133	4.796	-4.493	105
0	11	3	15.299	1.312	.062	2	6	4	1	1	255	255	186	52	43	216	55	54	218	85	53	134	.816	3.623	105
0	11	3	16.673	1.312	.062	2	6	4	1	1	255	255	224	62	42	224	68	64	234	78	78	134	3.367	-1.739	105
0	11	3	18.047	1.314	.062	2	6	4	1	1	255	255	186	78	13	212	65	72	212	67	72	132	2.755	-.725	105
0	11	3	19.422	1.313	.061	2	6	4	1	1	255	255	256	52	48	240	53	46	256	92	48	131	-.510	1.159	105
0	11	13	18.697	1.313	597.962	2	6	4	1	1	255	255	226	46	22	224	57	61	255	32	42	119	-.306	4.058	150
0	11	13	22.821	1.313	2.811	2	6	4	1	1	255	255	208	67	1	208	57	82	224	79	13	136	-3.265	-2.174	315
0	11	13	24.195	1.312	.061	2	6	4	1	1	255	255	192	56	48	195	54	46	283	89	90	136	4.592	-3.913	105

Figure 9. Data summary.

Data can also be output as a two-dimensional matrix of energy values. Energy and position units can be selected as described previously. Highlights can be added such as marking maximum count or blanking out cells with counts below a selectable threshold. The matrix plot also provides the sum of all counts in the frame. A portion of the program provides the two-dimensional matrix output for the first intuitive examination of the data. After the target and background statistical distributions have been determined, the two-dimensional matrix can be thresholded and output to give a qualitative feeling for seeker effectiveness and probable errors (Figure 10).

This two-dimensional matrix of energy values can be plotted in three dimensions, that is a plot of energy (as the vertical coordinate) versus spatial coordinates with the benefits described earlier. The sum of the columns is also plotted as a two-dimensional projection along the edge of the three-dimensional plot to provide a simulation of scan direction line detectors.

The KPLOT program provides plots of the statistics of single or accumulated data frames. It can produce bar or point histogram plots of the data probability densities, as well as the mean, variance, and standard deviation of a normal distribution which best fits those data.

Program GOWENS is a fly-in simulation model and edge-tracker model. The fly-in simulation is implemented by iteratively reducing the full frame of data to a smaller subset of data points to simulate range closure, simultaneously finding the statistics for the reduced scene. The same program can simulate an edge tracker by the same process on a line-by-line or column-by-column basis. Level slicing and thresholding can also be done in this program using a subroutine which places only those data points with counts inside a gate into a reduced matrix. Coordinates are encoded with the data values so that the gated data may be accurately reconstructed.

Program Gradient does the 2×2 and 3×3 spatial gradient calculations. The program utilizes a moving matrix and an absolute value calculation to approximate the temperature gradient. The 2×2 method calculates from the matrix:

a	b
c	d

The gradient, s, at point, a, is then given by

$$S = |a - d| + |b - c|$$

where $||$ is absolute value.

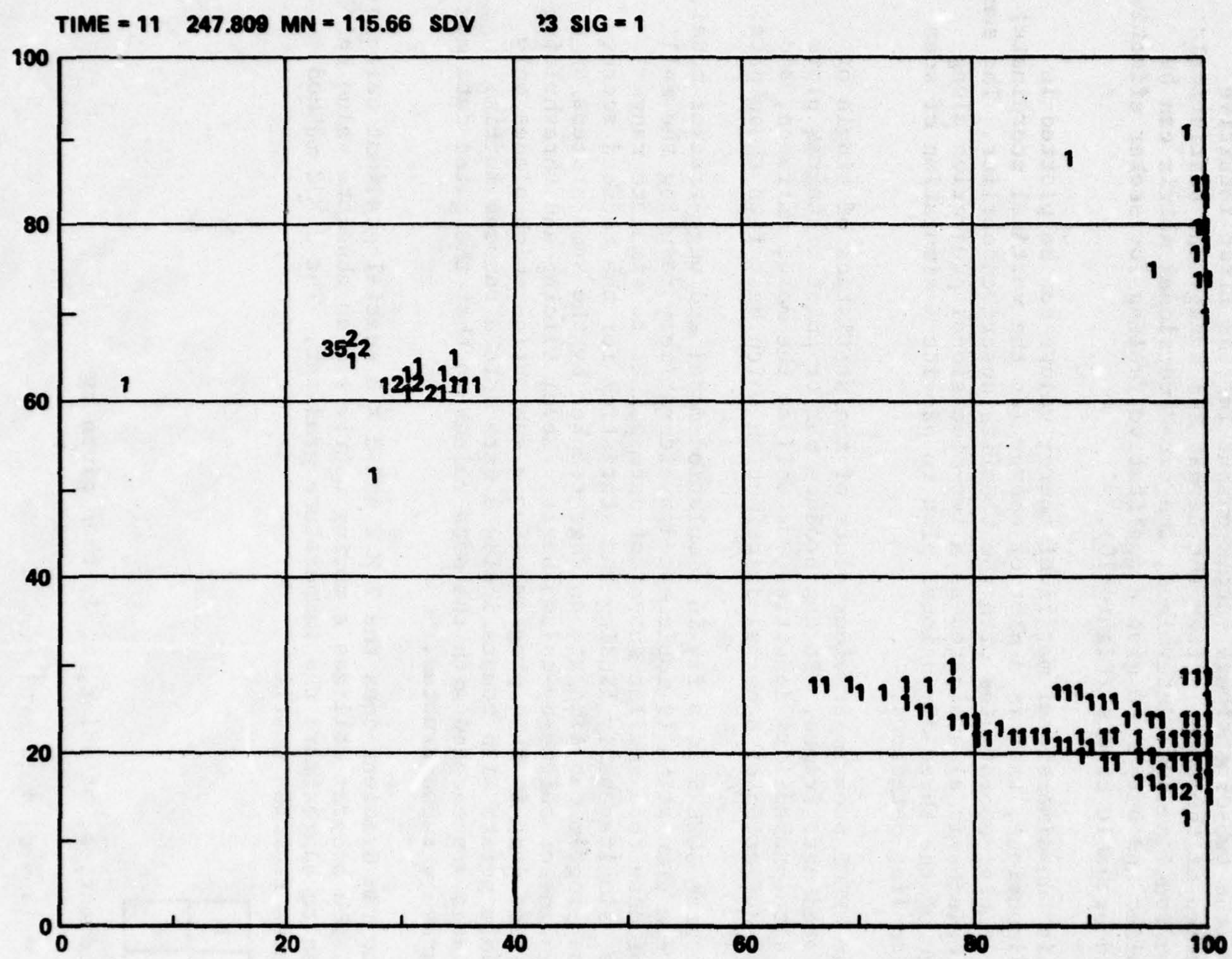

Figure 10. Threshold matrix sample plot.

The 3 × 3 method uses the matrix

a	b	c
c	e	f
g	h	i

and calculates the gradient, s, at point e as

$$S = |S_x| + |S_y|$$

where

$$S_x = (c + 2f + i) - (a + 2d + g)$$

$$S_y = (g + 2h + i) - (a + 2b + c) \quad .$$

S_x and S_y approximate the partial derivatives in the x and y directions, respectively, and can thus be used to simulate edge trackers.

VII. SOFTWARE USER INFORMATION

A. Introduction

This portion of the report is to provide a guide for prospective users of Program P2171, Program GOWENS and Program KPLOT. Setup procedures and various types of input and output will be demonstrated. It should also be noted that Program P2171 was modified from the original Eglin version to simulate IR-guided missile systems against certain armored targets.

B. Program P2171 Setup

The following files are used:

	Files	Description	Restrictions
1.	Input/Tape 5	Cards	Always
2.	Output/Tape 6	Time history listing	Always
3.	Tape 11	Primary data source PDP-15, picture data tapes or previous compressed P2171	Always
4.	Tape 10	P2385 or P2204 trackpoint range data tape	Optional

Files	Description	Restrictions
5. Tape 12	Compressed output tape of input Tape 11	Optional
6. FILMPL	Three-dimensional picture plots	Optional
7. Tape 9	Picture matrix listing	Optional

PROGRAM 2171 CARD INPUT

ALL CARDS ARE IDENTIFIED BY HOLLERITH CODES IN COLUMNS 1-5, COLUMNS 11-30 CONTAIN DATA AND/OR FLAGS DEPENDING ON CARD TYPE. FIELDS LEFT BLANK AND CARDS OMITTED ASSUME A DEFAULT VALUE.

CARD TYPES

```
1  TITLE CARD  - INDICATES TITLE CARD TO FOLLOW
                 (DEFAULT BLANK TITLE)

2  PLOT CARD   - DEFINES PLOT OPTIONS
                 (DEFAULT NO PLOT OUTPUT)

3  PRINT CARD  - DEFINES PRINT OPTIONS
                 (DEFAULT NO PRINT OUTPUT)

4  TAPE CARD   - DEFINES TAPE PARAMETERS, OUTPUT TAPE OPTION
                 DEFAULT - NUMBER SAMPLES/RECORD = 5
                           NUMBER MILLISECONDS/SAMPLE = 12.305
                           NO PACKED OUTPUT TAPE

5  TIME CARD   - DEFINES START,STOP TIME TO PROCESS
                 (DEFAULT ENTIRE TAPE)

6  LIMIT CARD  - DEFINES LINE TO PICK AS FIRST LINE OF THERMOVISION PICTURE
                 (DEFAULT 11)

7  CLASS CARD  - DEFINES CLASSIFICATION OF PLOT OUTPUT
                 (DEFAULT UNCLASSIFIED)

7A MSN LABEL CARD - ONLY ON CLASS CARD OPTION

7B AUTHORITY CARD - ONLY ON CLASS CARD OPTION

7C DOWNGRADE CARD - ONLY ON CLASS CARD OPTION

8  MATRIX CARD- DEFINES MATRIX OPTIONS
                 (DEFAULT NO MATRIX)

9  TRACK CARD  - DEFINE SOURCE OF RANGE. REL BRNG AND/OR TRACK PT
                 (DEFAULT NO I/P RANGE, RB, TRACK PT

10 VALID CARD  -  DEFINES VALID DATA SWITCH SETTING.
                 (DEFAULT- IGNORE VALID DATA SWITCH)

11 CONV  CARD  - SPECIFIES CONVERSION FACTOR FOR A GIVEN FILTER,
                 GAIN, AND  APERATURE.
                 DEFAULT- CONVERSION FACTOR = 1

12 DELETE CARD- SPECIFIES DELETE TIMES ✓
                 (DEFAULT NO DELETES)

13 CENTER CARD- SPECIFIES LIN AND WORD OF BORESIGHT OF AGA.
                 (DEFAULT LINE=60, WORD =45)

14 CAL ONLY    - SPECIFIES CALIBRATION FRAMES ONLY

15 MIN  CARD   - SPECIFIES THE PEAK VALUE BELOW WHICH A PICTURE IS
                 CONSIDERED TO BE NOT OF SIGNIFICANT LEVEL AND
                 WILL NOT BE PLOTTED
                 (DEFAULT.= 4*BACKGROUND LEVEL)

16 EDIT CARD   - DEFINES EDIT OPTIONS AND BACKGROUND LEVELS
                 (DEFAULT-SEE DEFINITION OF THIS CARD)

17 LABEL CARD  - DEFINES LOCATION AND HOLLERITH LABEL TO BE PUT ON
                 PLOT.
                 (DEFAULT - BLANK LABEL FOR UNDEFINED LOCATIONS)

18 GO CARD     - SIGNALS PROGRAM TO BEGIN EXECUTION

19 TAIL CARD   - SPECIFIES A CONSTANT LOCATION OF TAILPIPE AND TRACK
                 POINT (DEFAULT, NO CONSTANT LOCATION)
```

```
          TITLE CARD

     COLUMN 1-5 = TITLE
       THIS CARD IS FOLLOWED BY A CARD CONTAINING HOLLERITH INFORMATION TO
       BE PUT ON ALL PICTURES AND TOP OF PAGE OF PRINTOUTS

          PLOT CARD

COLUMN   NAME      DESCRIPTION                                         FORMAT
  1-4    KARD      "PLOT"
 11-12   IPLOT     0 = NO PLOT OUTPUT (DEFAULT)                          I2
                   1 = 3D PLOT OF AGA
                   2 = 3D PLOTS PLUS MAX SCALE SELECT
                   3 = 3D PLOTS PLUS INPUT SCALING
 13-14   IP3DL1    LINE NUMBER TO BEGIN 3D PLOT                          I2
                   (DEFAULT 11)
 15-16   IP3DL2    LINE NUMBER TO STOP 3D PLOT                           I2
                   (DEFAULT 110)
 17-18   IP3DW1    WORD NUMBER TO BEGIN 3D PLOT                          I2
                   (DEFAULT 1)
 19-20   IP3DW2    WORD NUMBER TO STOP 3D PLOT                           I2
                   (DEFAULT 100)
 21-22   NPL3D     SPECIFIES 3D PLOT RATE                                I2
                   1 = EVERY FRAME (DEFAULT)
                   2 = EVERY OTHER FRAME
                   3 = EVERY THIRD FRAME
                   .
                   .
 23-24   IVIEW     SPECIFIES VIEWING DIRECTION                           I2
                   1 = VIEW FROM BOTTOM OF AGA
                   2 = VIEW FROM RIGHT OF AGA
                   3 = VIEW FROM TOP OF AGA
                   4 = VIEW FROM LEFT OF AGA
 29-30   ISUM      1 = PLOTS SUM IN W/STR ON 3-D  PLOT                   I2
 31-40   WTOP      SCALE INPUT IF IPLOT .GT 1                          F10.0
                   IN RASTER COUNTS 0 .LE. WTOP.LE. 1024

          PRINT CARD

COLUMN   NAME      DESCRIPTION                                         FORMAT
  1-5    KARD      "PRINT"                                               A5
 11-12   IPRINT    0 = NO PRINT OUTPUT (DEFAULT)                         I2
                   1 = PRINT TIMES, FILTER, APERATURE, GAIN, CALIBRATE,
                       SOLID DATA, LENGTHS, AND A SPECIFIED CELL
                       (SEE IPVL, IPVW - COL 23-26) FOR EACH PICTURE.
                   2 = PRINT OPTION 1 PLUS PRINT CELLS IN SPECIFIC LINES
                       AND WORDS AT A SPECIFIED RATE. (SEE COL 13-22)
               IF  IPRINT.NE.2. COL 13-22 ARE IGNORED.
 13-14   IPRL1     LINE NUMBER TO BEGIN PRINT                            I2
                   (DEFAULT 11)
 15-16   IPRL2     LINE NUMBER TO STOP PRINT                             I2
                   (DEFAULT 100)
 17-18   IPRW1     WORD NUMBER TO BEGIN PRINT                            I2
                   (DEFAULT 1)
 19-20   IPRW2     WORD NUMBER TO STOP PRINT                             I2
                   (DEFAULT 100)
 21-22   NPRINT    SPECIFIES PRINT RATE                                  I2
                   1 = EVERY FRAME (DEFAULT)
                   2 = EVERY OTHER FRAME
                   3 = EVERY THIRD FRAME
                   .
                   .
 23-24   IPVL      LINE NUMBER OF PARTICULAR CELL TO BE PRINTED.         I2
                   (DEFAULT 50)
 25-26   IPVW      WORD NUMBER OF PARTICULAR CELL TO BE PRINTED.         I2
                   (DEFAULT 50)

          TAPE CARD

COLUMN   NAME      DESCRIPTION                                         FORMAT
  1-4    KARD      TAPE                                                  A4
 11-12   ITAPE     0 = NO PACKED TAPE OUTPUT (DEFAULT),I/P = PDP15 TAPE  I2
                   1 = MAKE PACKED OUTPUT TAPE,I/P = PDP15 TAPE
 13-14             2 = I/P IS PACKED TAPE
         NSR       NUMBER SAMPLES/RECORD ON INPUT TAPE                   I2
 15-16             (DEFAULT 5)
         ITSEND    /1=MAKE EXTERNAL TAPE TO BE SENT FROM TSX (SEE        I2
 41-50                 EXTERNAL TAPE O/P)
         DME       DELTA TIME BETWEEN SAMPLES ON INPUT TAPE IN
                   MILLISECONDS.  (DEFAULT 12.305 MS)
```

TIME CARD

COLUMN	NAME	DESCRIPTION	FORMAT
1-4	KARD	"TIME"	A4
11-19	START	HHMMSSSSS = START	I9
21-29	STOP	HHMMSSSSS = STOP NOTE: HH = HR MM = MIN SSSSS = MILLISECONDS	I9
31-40	M	IF NOT BLANK, THEN Y1= NO. OF FRAMES AFTER START TIME THAT IS TO BE OUTPUT. STOP TIME CAN BE LEFT BLANK IF THIS OPTION IS USED.	F10.6

LIMIT CARD

COLUMN	NAME	DESCRIPTION	FORMAT
1-4	KARD	"LIMIT"	A5
11-12	ITOP	LINE NUMBER TO CONSIDER TOP OF PICTURE (DEFAULT 11)	I2

CLASS CARD

COLUMN	NAME	DESCRIPTION	FORMAT
1-5	KARD	"CLASS"	A5
11-12	ICLASS	0 = UNCLASSIFIED (DEFAULT) 1 = CONFIDENTIAL 2 = SECRET 3 = TOP SECRET	I2
13-14	IR	0 = FILMPL SAD OPTION (DEFAULT NO FURTHER OPTIONS) 2-5=NUMBER OF SPECIAL DOWNGRADE CARD INPUT + 1 11-19=NUMBER OF PURE SPECIAL DOWNGRADE CARDS INPUT +10	I2
15-16	ID	0 = NO DOWNGRADE STAMP (DEFAULT) 1 = XGDS-1 STAMP 2 = XGDS-2 STAMP 3 = XGDS-3 STAMP 4 = XGDS-4 STAMP PRIOR TO JUN 72 5 = GDS (XGDS-4 AFTER JUN 72) STAMP 6 = XCL STAMP 7 = XGDS NO CATAGORY STAMP	I2
17-18	IS	0 = NO STAMP (DEFAULT) 1 = 'RESTRICTED DATA' STAMP 2 = 'FORMERLY RESTRICTED DATA' STAMP 3 = 'NATIONAL SECURTIY SECURITY INFORMATION' STAMP	I2
19-20	IW	0 = NO STAMP (DEFAULT) 1 = 'WARNING NOTICE SS & MI' STAMP	I2
21-22	IN	0 = NO STAMP (DEFAULT) 1 = 'NO FOREIGN DISSEM' STAMP	I2

MSN LABEL CARD

(MUST FOLLOW CLASS CARD IF IR GT 0)

COLUMN	NAME	DESCRIPTION	FORMAT
1-4	IJOB	JOB NUMBER	A4
11-20	IPROJ	PROJECT NUMBER	A10
21-30	IMSN	MISSION NUMBER	A10
31-40	IDATE	MISSION DATE	A10
41-50	IRUN	HOLLERITH JOB LABEL I. E. F. Q. L.	A10
51-60	IDAY	JOB RUN DAY	A10

```
AUTHORITY CARD

(MUST FOLLOW MSN LABEL CARD IF IR = 1 THRU 5)

COLUMN  NAME   DESCRIPTION                                              FORMAT
1-59    IAUTHR  CLASSIFING AUTHORITY FOR DOWNGRADE STAMP                   A59
70-79   IDCLAS  DECLASSIFICATION DATE                                      A10
80      4       C = IF BLANK IDCLAS IS USED                                 A1
                U = UPON NOTIFICATION BY THE ORIGINATOR
                N = NOT AUTOMATICALLY DECLASSIFIED


DOWNGRADE  CARD

(MUST FOLLOW AUTHORITY CARD IF IR>2, MSN LABEL CARD IF IR>10)

COLUMN  NAME DESCRIPTION                                                FORMAT
1-80            HOLLERITH DOWNGRADE STAMP TO BE USED IF IR > 10         8A10
             OR MODIFICATION TO DOWNGRADE STAMP STARTING WITH
             DECLASIFICATION LINE + 4 CARDS UNLESS XCL TO BE
             MOD THEN 6 CARDS ALLOWED  IF IR >10,9 CARDS ALLOWED


MATRIX CARD

COLUMN  NAME    DESCRIPTION                                             FORMAT
 1-4    KARD    "MATR"                                                      A4
11-12   IMTX    =0, INDICATES NO MATRIX OUTPUT (DEFAULT)                    I2
                =N, INDICATES SELECT EVERY NTH FRAME THAT IS
                    CONSIDERED FOR OUTPUT (SEE COL 15-16)
13-14   IFEET   =0, MATRIX WILL BE OUTPUT IN DEGREE CELL UNITS              I2
                =1, MATRIX WILL BE OUTPUT IN FEET CELL UNITS
15-16   RBCELL  CONSIDER FOR MATRIX OUTPUT IF RELATIVE BEARING              I2
                HAS CHANGED BY MORE THAN RBCELL (DEG).NOTE:
                IF=0,THEN EVERY FRAME WILL BE CONSIDERED.
17-18  IFIND 1 = PROGRAM SELECTS OWN MATRIX LENGTH PARAMETERS               I2
19-20 IPRMTX      1 = MATRIX DISPOSITION TO TAPE9                           I2
31-40   DLEFT   IF NE 0, THEN IS LEFT LIMIT OF MATRIX  FROM THE          F10.2
                 TAIL PIPE LOCATION (DEFAULT =2.0)
41-50   DRIGHT  IF NE 0, THEN IS RIGHT LIMIT OF MATRIX                   F10.2
                FROM TAIL PIPE LOCATION (DEFAULT = 8.0)
51-60   NFRMTX  IF.NE.0 THEN IS MAXIMUM NO OF FRAMES TO                  F10.2
                USE FOR IR MATRIX. (DEFAULT 4)
                NOTE: PROGRAM WILL START AT CELL CORRESPONDING
                TO DLEFT AND CONSTRUCT THE MATRIX TO THE CELL
                CORRESPONDING TO DRIGHT OR NFRMTX FRAMES


TRACK CARD                                                              FORMAT

COLUMN  NAME    DESCRIPTION                                                 A4
 1-4    KARD    "TRAC"
11-12   ITRK    =-2, DO NOT READ TAPE10. USE MAX AGA VALUE TO               I2
                     FIND TAIL PIPE LOCATION
                =-1, DO NOT READ TAPE , USE CONSTANT LOCATION
                     FOR TRACK POINT AND TAIL PIPE.(SEE TAIL CARD)
                = 0, DO NOT READ TAPE10. DO NOT OUTPUT IR MATRIX
                = 1, READ TAPE10. TAIL PIPE LOCATION TO BE SELECTED
                     FROM TV VIDEO LOCATION. WHEN NOT AVAILABLE,
                     USE MAX AGA LOCATION. (TRACK PT FROM VCO SIGNAL)
                = 2, READ TAPE10.USE MAX AGA TO FIND TAIL PIPE, USE
                     TV VIDEO WHEN LOCATION FROM MAX AGA CANNOT BE FOUND.
[redacted]
13-14   ITPT    1 = TRACK POINT MARK TO BE TAKEN FROM T V VIDEO             I2
```

VALID CARD

COLUMN	NAME	DESCRIPTION	FORMAT
1-4	KARD	"VALI"	A4
11-12	IVALID	VALID DATA SWITCH SETTING(DEFAULT=IGNORE)	I2

CONV CARD

COLUMN	NAME	DESCRIPTION	FORMAT
1-4	KARD	"CONV"	A4
11-12	IF	FILTER NUMBER	I2
13-14	IA	APERATURE NUMBER	I2
15-15	IG	GAIN NUMBER	I2
31-40	CONV	CONVERSION FACTOR FROM COUNTS TO W1(CM**2*SR) FOR IF,IA, IG COMBINATION	F10.2
		NOTE: CONVERSION FACTOR EQUALS (AVERAGE INTERNAL LAB COUNT)*(SLOPE)/(AVG INFLIGHT CAL COUNT)	

DELETE CARD

COLUMN	NAME	DESCRIPTION	FORMAT
1-4	KARD	"DELE"	A4
11-19	TDELE	HHMMSSSSS =START OF DELETE INTERVAL	I9
21-29	TDELE	HHMMSSSSS =END OF DELETE INTERVAL	I9
		NOTE: UP TO 25 DELETE CARDS MAY BE INPUT	

CENTER CARD

COLUMN	NAME	DESCRIPTION	FORMAT
1-4	KARD	"CENT"	A4
11-12	ILCENT	LINE NUMBER OF CENTER OF AGA (DEFAULT=60)	I2
13-14	IWCENT	WORD NUMBER OF CENTER OF AGA (DEFAULT=45)	I2
31-40	RESLIM	RESOLUTION OF ONE LINE OF AGA (DEFAULT=10/69 DEG)	F10.2
41-50	RESWD	RESOLUTION OF ONE WORD OF AGA (DEFAULT=5/49 DEG)	F10.2

CAL ONLY CARD

COLUMN	NAME	DESCRIPTION	FORMAT
1-4	KARD	"CAL"	A4
11-12	ICAL	=1, INDICATES SELECT CALIBRATION FRAMES ONLY	I2

MIN CARD

COLUMN	NAME	DESCRIPTION	FORMAT
1-4	KARD	"MIN"	A4
31-40	MNVAL	SPECIFIES MINIMUM COUNT FOR DELETING PLOT OF A PICTURE. IF MAX VALUE OF A PICTURE IS BELOW THIS LEVEL, IT WILL NOT BE PLOTTED.	

EDIT CARD

COLUMN	NAME	DESCRIPTION	FORMAT
1-4	KARD	"EDIT"	A4
11-12	IEDT	=0, DO NOT EDIT NOISE SPIKES IN PICTURE	I2
		=1, EDIT NOISE SPIKES (DEFAULT)	
31-41	IEDUP	IF GT 1.0, THEN SPECIFIES COUNT VALUE ABOVE WHICH	F10.2
		A CELL WILL BE CONSIDERED POSSIBLE NOISE SPIKE.	
		(DEFAULT = MAX((4*AVG OF BACKGROUND PEAKS),30))	
41-50	IEDOWN	IF GT 1.0, THEN SPECIFIES VALUE THAT THE	F10.2
		CORRESPONDING WORDS ON ADJACENT LINES MUST BE BELOW	
		IN ORDER FOR A CELL TO BE CONSIDERED A NOISE SPIKE.	
		(DEFAULT = 1.75* BACKGROUND)	
51-60	IBK	IF GT 1, THEN SPECIFIES COUNT VALUE TO BE	F10.2
		CONSIDERED BACKGROUND LEVEL	
61-70	PCT	MULTIPLICATION FACTOR TO DETERMINE AND OPTIMAL	
		BACKGROUND LEVEL.	
		NOTE: LET AVG= AVERAGE OF PEAKS IN PICTURE BELOW 200 COUNTS	
		THE OPTIMAL BACKGROUND= AVG + PCT* AVG	
		(DEFAULT FOR PCT =.75)	

LABEL CARD

COLUMN	NAME	DESCRIPTION	FORMAT
1-4	KARD	"LABE"	A4
11-12	ILAB	LINE NO FOR PLACEMENT OF THIS LABEL ON 3D PLOTS	I2
21-40	LABEL	HOLLERITH LABEL INFORMATION TO PUT AT ILAB	A10
		LOCATION NOTE: UP TO 25 LABEL CARDS MAY BE INPUT.	
		AFTER A LABEL CARD HAS BEEN INPUT,THEN IT	
		WILL BE DISPLAYED UNTIL A NEW LABEL CARD IS	
		INPUT IN IT'S PLACE, THEREFORE, IF IT IS	
		DEISRED TO REMOVE A PARTICULAR LINE OF INFO, A	
		LABEL CARD WITH CORRESPONDING LINE NO. MUST BE	
		INPUT WITH COL 21-40 BLANK.	

TAIL CARD

COLUMN	NAME	DESCRIPTION	FORMAT
1-4	KARD	"TAIL"	A4
31-40	ATP	CONSTANT LOCATION FOR AZIMUTH OF TAIL PIPE	F10.0
41-50	ETP	CONSTANT LOCATION FOR ELEVATION OF TAIL PIPE	F10.0
51-60	ATRK	CONSTANT LOCATION FOR AZIMUTH OF TRACK POINT	F10.0
61-70	ETRK	CONSTANT LOCATION FOR ELEVATION OF TRACK POINT	F10.0
		NOTE: THIS CARD WOULD ONLY BE INPUT WHEN THE	
		AZIMUTH AND ELEVATION OF TAIL PIPE AND TRACK POINT	
		WERE KNOWN FOR A PARTICULAR PICTURE.	

GO CARD

COLUMN	NAME	DESCRIPTION	FORMAT
1-4	KARD	"GO"	A4
		THIS CARD SIGNALS PROGRAM TO BEGIN PROCESSING	
		AFTER REQUESTED DATA HAS BEEN PROCESSED, PROGRAM	
		WILL READ NEW CONTROL CARD.	

```
                    TAPE11 (INPUT)

THE PROGRAM WILL ACCEPT ONE OF TWO TYPES OF TAPE AS INPUT ON
UNIT 11,(SEE"TAPE" CARD).
    TYPE 1.  (WHEN ITAPE=0)
 THIS IS A TAPE PRODUCED BY PROGRAM P5200 ON PDP15 COMPUTER.
 NORMALL THIS TAPE WILL CONTAIN 720 EIGHTEEN BIT WORDS/RECORD.
 EACH RECORD MAY BE DIVIDED INTO TWO BUFFERS. THE FIRST BUFFER
 CONTAINS 5 SAMPLES OF 140 WORDS/SAMPLE OF RAW AGA DATA. THE
 SECOND BUFFER CONTAINS TIME WORDS IN THREE-WORD SETS AS FOLLOWS.
      WORD 1 - TIME,SECONDS
      WORD 2 - TIME, MILLISECONDS
      WORDS 3 - SAMPLE COUNT
   THE SAMPLE COUNT INDICATES THE LAST SAMPLE IN THE SAMPLE
  BUFFER FOR WHICH A TIME CAN BE COMPUTED USING THE TIME
  GIVEN + THE AVERAGE TIME BETWEEN SAMPLES. IF WORD 3 EQUALS
  NO OF SAMPLES (5) THEN ONLY ONE SET OF TIME WORDS WILL BE
  GIVEN. IF NOT, THEN THE NEXT SET OF TIME WORDS MUST BE USED
  TO COMPUTE THE TIME OF SAMPLES CORRESPONDING TO THE SAMPLE
  COUNT IN WORD THREE +1 TO THE SAMPLE COUNT OF WORD SIX.
  THIS CONINUES UNTIL THE SAMPLE COUNT OF A SET OF TIME WORDS
  IS EQUAL TO THE NO OF SAMPLES. IF THERE WERE A TIME JUMP FOR
  EVERY SAMPLE OF A RECORD THEN THERE WOULD BE GIVEN A SET OF
  TIME WORDS FOR EACH SAMPLE.
   EACH WORD IN THE SAMPLE BUFFER CONTAINS 10 BITS OF DATA,
  RIGHT ADJUSTED. THE FORMAT OF A SAMPLE IS AS FOLLOWS
      WORD        DESCRIPTION
      1-138       AGA DATA   (IN RIGHT 10 BITS OF EACH WORD)
      139         LINE COUNT WORD
      140         FRAME SYNC  WORD  ////////////111/11
                  FORMAT OF WORD 139
                     BIT
                    1-8  PADDING
                    9-16 COUNTER
                   17-18 DATA TYPE
                           IF=00, THEN SAMPLE IS BETWEEN PICTURES,
                            THE COUNTER = A/C LENGTH
                            AND WORD 1 CONTAINS THE FOLLOWING
                              BIT  (1-8) =PADDING
                              9-11   =FILTER  POSITION
                            12-14   =APERATURE POSITION
                            15-16   =GAIN POSITION
                             17       =VALID  DATA SWITCH
                             18       =CALIBRATE SWITCH

                           IF = 11, THEN SAMPLE IS A LINE OF
                            THE PICTURE, AND THE COUNTER IS THE
                            LINE POSITION IN PICTURE OF NEXT LINE.

      TYPE 2.    (WHEN ITAPE = 02)
 THIS IS A COMPACTED TAPE PRODUCED BY THE PROGRAM FROM A
 PREVIOUS RUN WITH ITAPE =1. EACH LOGICAL RECORD IS 2015
 SIXTY BIT WORDS.
    WORD          DESCRIPTION
      10          TIME OF PICTURE
       2          FILTER POSITION   BEFORE
       3          APERATURE POSITION  BEFORE
       4          GAIN POSITION BEFORE
       5          CALIBRATE       BEFORE
       6          VALID DATA     BEFORE
       7          A/C LENGTH     BEFORE
       8          TIME OF FIRST LINE AFTER PICTURE
       9          FILTER POSITION AFTER
      10          APERATURE POSITION AFTER
      11          GAIN POSITION AFTER
      12          CALIBRATE  AFTER
      13          VALID DATA AFTER
      14          A/C LENGTH AFTER
      15          NO OF LINES INPUT FOR THIS PICTURE.
   16-35          TOP LINE OF PICTURE
   17-35            SECOND FROM TOP LINE OF PICTURE
        .
        .
        .
   1995-2015      BOTTOM LINE OF PICTURE
```

C. Program GOWENS Setup

This program was developed in-house as a simulation tool to evaluate each frame of IR data efficiently without utilizing large amounts of computer resources (memory, time, etc.) which are required by Program P2171. Program GOWENS will read the same input tape (Tape 11) as Program P2171; sort and process IR data are to be plotted with Program KPLOT.

The following files are used:

	Files	Description	Restriction
1.	Input/Tape 5	Cards	Always
2.	Input/Tape 1	Primary data source, same as Tape 11, P2171	Always
3.	Output/Tape 6	Listing of variables (user may select any variable)	Optional
4.	Tape 2/Tape 3	Sort merge	Always
5.	Tape 7	Processed IR data (cataloged)	Always

Program GOWENS Input/Output

1. KT Card . . . Frame number card, 16I5, to identify those frames to be evaluated. If frame = 0 or -1, program will stop.

2. IFIL Card . . . Time ID card, 5I3,2F10.3, 4A10, select frame by time, filter, gain, and aperture setting. The view is also included.

3. Tape 1 . . . Primary IR data source (Eglin AFB).

4. Tape 2 . . . File to be sorted, input to Tape 3.

5. Tape 3 . . . File containing sorted IR data (maximal to minimal intensity).

6. Tape 7 . . . Output of processed IR data, contains frame times, the view if any, largest 200 data values, and the location of each value in the frame.

D. Program KPLOT

Program KPLOT is a mathematical model developed for graphical evaluation of the output produced by Program GOWENS. KPLOT generates bar and point plots by interacting with the Tektronix software plotting routines. In bar plot graphing, the number of IR data points is plotted

versus the intensity range which can be expressed in measurements of counts or watts per steradian. KPLOT will also illustrate a frame of data (100 × 100 matrix) and show the location and intensity of all hot spots in the frame.

The following files are used:

	Files	Description	Restrictions
1.	Input/Tape 5	Interaction with terminal	Always
2.	Input/Tape 7	Processed IR data	Always
3.	Input/AGII	Tektronix Software	Always
4.	Output/Tape 6	Information display (Plots)	Always

Program KPLOT Input/Output

NOTE KPLOT is an interactive program that is run on a terminal.

1. Tape 7 . . . Primary input for KPLOT (same as Tape 7 in GOWENS).
2. AGII . . . Tektronix Software.
3. Tape 5/Tape 6 . . . interactive I/O with terminal.
4. Output . . . barplots, display of frame and location of heat sources. (Figures 1 and 2).

VIII. COMPUTER PROGRAM LISTINGS

The listing for BASES Program P2171 is presented in Appendix A. Program GOWENS follows in Appendix B. Program KPLOT listings are contained in Appendix C.

IX. SUMMARY

The nine different computer models outlined and described in the introduction all utilize different discriminants to investigate the spatial radiance of target and clutter. Of the nine different computer models, only three are contained in the Computer Program Listing (Appendices A, B, and C) in order to minimize the size of this report. In the case of energy computer model described in the report the overlapping areas between target and clutter represent a loss function where targets would be classified as clutter or vice versa. In the search for a means to minimize this loss function, the authors believe the Graphics target clutter frame-to-frame comparison model coupled with

the two-dimensional gradient and spatial discriminator model offer the most effective and sophisticated approach to optimize the true target selection criteria for most clutter conditions.

However, it is anticipated that even after maximizing the use of these two computer models in complex clutter environments, some loss function may still exist. Consequently, additional independent samples of data should be utilized with multispectral data reduction algorithms for further reduction of the previously mentioned loss function.

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2. Robinson, D. Z., "Methods of Background Description and Their Utility," Proceedings of IRE, Vol. 47, No. 9, September 1959, pp. 1554-1561.

3. Tsutsumi, S. and Takgi, T., "Optimum Spatial Filter for an Anisotropic Background Noise," Electronics and Communications in Japan, Vol. 54-C, No. 9, 1971.

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Appendix A. LISTING FOR BASES PROGRAM P2171

PT01S4T
PT01S4T
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PT01S4T
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PT01S4T
PT01S4T
PT01S4T

```
*****    *IDENT SEPT12
/////    *INSERT MAY75.38
             ICS=ICS*10
/////    *INSERT MAY75.44
             ICS=ICS*10
/////    *INSERT MAY75.49
             ICS=ICS*10
/////    *INSERT THERMC.1994
             SUBROUTINE UNPACK(IN,MTAB,MOUT)
             DIMENSION IN(1),MTAB(1),MOUT(1),MASK(60)
             CALL GETMSK(MASK)
             I=0
             M=0
             MWORD=1
             MBIT=60
          10 I=I+1
             KTAB=MTAB(I)
             IF(KTAB)20,90,40
          20 MBIT=MBIT+KTAB
          25 IF(MBIT)30,70,10
          30 MBIT=60+MBIT
             MWORD=MWORD+1
             GO TO 25
          40 M=M+1
             MDIF=MBIT-KTAB
             IF(MDIF)50,60,80
          50 IWORD=SHIFT(AND(IN(MWORD),MASK(MBIT)),-MDIF)
             MWORD=MWORD+1
             MBIT=60+MDIF
             MOUT(M)=OR(IWORD,AND(SHIFT(IN(MWORD),-MBIT),MASK(-MDIF)))
             GO TO 10
          60 MOUT(M)=AND(IN(MWORD),MASK(KTAB))
          70 MBIT=60
             MWORD=MWORD+1
             GO TO 10
          80 MBIT=MDIF
             MOUT(M)=AND(SHIFT(IN(MWORD),-MDIF),MASK(KTAB))
             GO TO 10
          90 RETURN
             END
             SUBROUTINE DONE(IT)
        C    SUBROUTINE TO DISMOUNT TAPE IT, AND MOUNT NEXT TAPE.
             PAUSE " MOUNT NEXT TAPE "
             RETURN
             END
             SUBROUTINE GETMSK(IM)
             DIMENSION IM(60)
             DATA MASK/00000000000000000001B/
             IM(1)=MASK
             DO 10 I=2,57
             IM(I)=OR(SHIFT(IM(I-1),1),MASK)
          10 CONTINUE
             IM(58)=17777777777777777777B
             IM(59)=37777777777777777777B
             IM(60)=77777777777777777777B
```

```
         END

     MODIFICATIONS / CONTROL CARDS

THERMO       ICS=ICS*10                                                      SEPT12      1     I
THERMO       ICS=ICS*10                                                      SEPT12      2     I
THERMO       ICS=ICS*10                                                      SEPT12      3     I
THERMO       SUBROUTINE UNPACK(IN,MTAB,MOUT)                                 SEPT12      4     I
THERMO       DIMENSION IN(1),MTAB(1),MOUT(1),MASK(60)                        SEPT12      5     I
THERMO       CALL GETMSK(MASK)                                               SEPT12      6     I
THERMO       I=0                                                             SEPT12      7     I
THERMO       M=0                                                             SEPT12      8     I
THERMO       MWORD=1                                                         SEPT12      9     I
THERMO       MBIT=60                                                         SEPT12     10     I
THERMO    10 I=I+1                                                           SEPT12     11     I
THERMO       KTAB=MTAB(I)                                                    SEPT12     12     I
THERMO       IF(KTAB)20,90,40                                                SEPT12     13     I
THERMO    20 MBIT=MBIT+KTAB                                                  SEPT12     14     I
THERMO    25 IF(MBIT)30,70,10                                                SEPT12     15     I
THERMO    30 MBIT=60+MBIT                                                    SEPT12     16     I
THERMO       MWORD=MWORD+1                                                   SEPT12     17     I
THERMO       GO TO 25                                                        SEPT12     18     I
THERMO    40 M=M+1                                                           SEPT12     19     I
THERMO       MDIF=MBIT-KTAB                                                  SEPT12     20     I
THERMO       IF(MDIF)50,60,80                                                SEPT12     21     I
THERMO    50 IWORD=SHIFT(AND(IN(MWORD),MASK(MBIT)),-MDIF)                    SEPT12     22     I
THERMO       MWORD=MWORD+1                                                   SEPT12     23     I
THERMO       MBIT=60+MDIF                                                    SEPT12     24     I
THERMO       MOUT(M)=OR(IWORD,AND(SHIFT(IN(MWORD),-MBIT),MASK(-MDIF)))       SEPT12     25     I
THERMO       GO TO 10                                                        SEPT12     26     I
THERMO    60 MOUT(M)=AND(IN(MWORD),MASK(KTAB))                               SEPT12     27     I
THERMO    70 MBIT=60                                                         SEPT12     28     I
THERMO       MWORD=MWORD+1                                                   SEPT12     29     I
THERMO       GO TO 10                                                        SEPT12     30     I
THERMO    80 MBIT=MDIF                                                       SEPT12     31     I
THERMO       MOUT(M)=AND(SHIFT(IN(MWORD),-MDIF),MASK(KTAB))                  SEPT12     32     I
THERMO       GO TO 10                                                        SEPT12     33     I
THERMO    90 RETURN                                                          SEPT12     34     I
THERMO       END                                                             SEPT12     35     I
THERMO       SUBROUTINE DONE(IT)                                             SEPT12     36     I
THERMO  C    SUBROUTINE TO DISMOUNT TAPE IT, AND MOUNT NEXT TAPE.            SEPT12     37     I
THERMO       PAUSE " MOUNT NEXT TAPE "                                       SEPT12     38     I
THERMO       RETURN                                                          SEPT12     39     I
THERMO       END                                                             SEPT12     40     I
THERMO       SUBROUTINE GETMSK(IM)                                           SEPT12     41     I
THERMO       DIMENSION IM(60)                                                SEPT12     42     I
THERMO       DATA MASK/00000000000000000010/                                 SEPT12     43     I
THERMO       IM(1)=MASK                                                      SEPT12     44     I
THERMO       DO 10 I=2,57                                                    SEPT12     45     I
THERMO       IM(I)=OR(SHIFT(IM(I-1),1),MASK)                                 SEPT12     46     I
```

```
UNLABELED OLDPL          MODIFICATIONS / CONTROL CARDS          UPDATE 1.2-74352.     09/29/76  12.57.18.     PAGE   3

THERMO      10 CONTINUE                                                               SEPT12       47      I
THERMO         IN(58)=17777777777777777777B                                           SEPT12       48      I
THERMO         IN(59)=37777777777777777776B                                           SEPT12       49      I
THERMO         IN(60)=77777777777777777777B                                           SEPT12       50      I
THERMO         END                                                                    SEPT12       51      I
THERMO     *WEOR                                                                      THERMO     1999


              CORRECTION IDENTS ARE LISTED IN CHRONOLOGICAL ORDER OF INSERTION

         THERMO.    MAY75     SEPT12


DECKS ARE LISTED IN THE ORDER OF THEIR OCCURRENCE ON A NEW PROGRAM LIBRARY IF ONE IS CREATED BY THIS UPDATE

         YANK$$$    THERMO


         DECKS WRITTEN TO COMPILE FILE

         THERMO


 THIS UPDATE REQUIRED   33600B WORDS OF CORE.
```

```
      PROGRAM P2171(INPUT,OUTPUT,TAPE5=INPUT,TAPE6=OUTPUT,TAPE11,           THERMO     2
     1 TAPE9,TAPE10,TAPE12,TAPE14,TAPE4=INPUT)                              MAY75      1
      COMMON IBEFOR(7),IAFTER(7),ITOP,IPICT(10100)                          THERMO     4
        COMMON/IPMTX/NLEFT,NRIGHT,IWTP,ILTP,IBKGR,CONVF,MAXCNT,JEND,NFR,    THERMO     5
     .   RESLFT,RESWFT,LABEL,LABEL1(2,6),XSUM,RESRAD,SR                     THERMO     6
     .,IWTRK,ILTRK,XTRK,YTRK,ITPT                                           THERMO     7
     ., IPRMTX,ISUMM                                                        THERMO     8
       COMMON/PDPFT/NWS,NSR,ONE,IEND,JSTOP,START,STOP,ICKSTR,ICKSTP         THERMO     9
     . ,IVALID,ICAL,INPT                                                    THERMO    10
       COMMON/MAXVAL/UFCR,UBACK,VLEFT,VRIGHT,WBOT,WTOP,THETA,               THERMO    11
     .  UAXIS,VAXIS,UVPLNE ,IU(2,2),IV(2,2),IW(2,2)                         THERMO    12
       COMMON/PLIM/IFOR,IBACK,ILEFT,IRIGHT,IVIEW,IPASS                      THERMO    13
C**** THIS PROGRAM READS AN AGA THERMOVISION TAPE PRODUCED BY P5200.         THERMO    14
C     O/P MAY BE LISTING, 3-D PICTURES, AND PACKED TAPE AS PER OPTIONS.     THERMO    15
                                                                            THERMO    16
C***  VARIABLE IDENTIFICATION.                                              THERMO    17
C     NWS=NO. OF WORDS/SAMPLE ON I/P TAPE (140)                             THERMO    18
C     NSR=NO. OF SAMPLES/RECORD ON I/P TAPE (1-5)                           THERMO    19
C     ONE = NO OF MILLISECONDS/SAMPLE ON I/P TAPE0                          THERMO    20
C     IEND= NOO OF FILES READ.                                              THERMO    21
C     JSTOP=1, IF TIME GREATER THAN STOP TIME                               THERMO    22
C          =0, OTHERWISE.                                                   THERMO    23
C     START= START TIME IN MILLISECONDS.                                    THERMO    24
C     STOP= STOP TIME IN MILLISECONDS.                                      THERMO    25
C     IPRINT= 0, NO PRINTED O/P                                             THERMO    26
C            =1, PRINT TIME AND SWITCH SETTINGS.                            THERMO    27
C            =1, PRINT TIME,SWITCH SETTINGS, AND SPECIFIED WORDS.           THERMO    28
C     IPLOT=0, NO PLOT O/P                                                  THERMO    29
C          =1, PLOT 3D IMAGE OF PICTURE                                     THERMO    30
C          =2, PLOT 2D OF LINES AND WORDS SPECIFIED.                        THERMO    31
C     ITAPE=0, NO O/P TAPE0                                                 THERMO    32
C          =1, MAKE PACKED O/P TAPE                                         THERMO    33
                                                                            THERMO    34
                                                                            THERMO    35
      DIMENSION CONV(8,2,4),TAP10(30)                                       THERMO    36
      DIMENSION LABEL(2,25),KRD(8),IOPT(10)                                 THERMO    37
      DIMENSION TOELE(2,25)                                                 THERMO    38
      COMMON /CLASF/ ICLASS,TITLE(8)                                        THERMO    39
      DIMENSION IFILT(8)                                                    THERMO    40
      DIMENSION IPIC(100,100)                                               THERMO    41
       DIMENSION XPICT(100)                                                 THERMO    42
      EQUIVALENCE(IPICT(10001),XPICT(1))                                    THERMO    43
       EQUIVALENCE(IPIC(1,1),IPICT(1)),(T1,IBEFOR(1)),(T2,IAFTER(1))        THERMO    44
       LOGICAL IPL3D,IPL2D                                                  THERMO    45
                                                                            THERMO    46
      DATA TAP10/30*0./                                                     THERMO    47
      DATA CONV/256*1.0/                                                    THERMO    48
       DATA LABEL/50*1H  /                                                  THERMO    49
      DATA IFILT / 10H2.0 - 5.5   ,                                         THERMO    50
     .             10H3.97-4.81   ,                                         THERMO    51
     .             10H3.88-4.64   ,                                         THERMO    52
     .             10H2.0 - 5.5  ,                                          THERMO    53
     .             10H2.3 - 3.3   ,                                         THERMO    54
     .             10H2.9 - 3.8   ,                                         THERMO    55
     .             10H4.05-4.9    ,                                         THERMO    56
     .             10H4.17-4.2    /                                         THERMO    57
      F(X,A1,A2,FA1,FA2)=(X-A2)*FA1/(A1-A2)+(X-A1)*FA2/(A2-A1)             THERMO    58
```

```
      C**** SET DEFAULT VALUES.                                        THERMO   59
            NMS=140                                                    THERMO   60
            NSR=9                                                      THERMO   61
            ONE=12.305                                                 THERMO   62
             DO 2 I=1,6                                                THERMO   63
             TITLE(I)=1H                                               THERMO   64
            LABEL(1,I)=10H                                             THERMO   65
          2 CONTINUE                                                   THERMO   66
            NPICT=0                                                    THERMO   67
             LABEL(1,5)=10HFILTER =                                    THERMO   68
            ITRK=0                                                     THERMO   69
             LIN9=-1                                                   THERMO   70
            IT10=18                                                    THERMO   71
             ILCENT=60                                                 THERMO   72
             INCENT=49                                                 THERMO   73
            RESLIN=10./69                                              THERMO   74
             RESWD=5./49                                               THERMO   75
            RADLIN=RESLIN*.0174532952                                  THERMO   76
            RADWD=RESWD*.0174532952                                    THERMO   77
            RESRAD=RADLIN*RADWD                                        THERMO   78
            IFIND=1                                                    THERMO   79
            ISLEFT=1                                                   THERMO   80
            ISRITE=100                                                 THERMO   81
            IBOVE=1                                                    THERMO   82
             IBELOW=100                                                THERMO   83
            IJSUM=0                                                    THERMO   84
             DLEFT=-2.0                                                THERMO   85
              DRIGHT=8.0                                               THERMO   86
             DABOVE=2.2                                                THERMO   87
             DBELOW=-2.2                                               THERMO   88
             IPEET=0                                                   THERMO   89
            IDEL=0                                                     THERMO   90
            NFRMTX=4                                                   THERMO   91
             SR=500.                                                   THERMO   92
             ATP=0.0                                                   THERMO   93
            ETP=0.0                                                    THERMO   94
            XTRK=-9999.                                                THERMO   95
            YTRK=-9999.                                                THERMO   96
             RB=270.0                                                  THERMO   97
             DA=0.0                                                    THERMO   98
              ATRK=0.0                                                 THERMO   99
             ETRK=0.0                                                  THERMO  100
            ILTP=49                                                    THERMO  101
             ABIAS=0.0                                                 THERMO  102
             EBIAS=0.0                                                 THERMO  103
             IMXCT=-1                                                  THERMO  104
            ITSEND=0                                                   THERMO  105
            IFSEND=0                                                   THERMO  106
              TTDIF=0.0                                                THERMO  107
             IWTP=45                                                   THERMO  108
             IBK=0                                                     THERMO  109
            MINVAL=0                                                   THERMO  110
            MNVAL=0                                                    THERMO  111
            IEDCNT=100                                                 THERMO  112
             MINLOT=20                                                 THERMO  113
             IEDT=1                                                    THERMO  114
            IEDUF=0                                                    THERMO  115
```

```
      IEDOWN=0                                                          THERMO 116
       ICLFRM=0                                                         THERMO 117
      MXL1=58                                                           THERMO 118
       IMXL=1                                                           THERMO 119
      IMXW=1                                                            THERMO 120
      MXW1=23                                                           THERMO 121
      MXL2=60                                                           THERMO 122
      MXW2=63                                                           THERMO 123
       IMTX=0                                                           THERMO 124
       IPRMTX=0                                                         THERMO 125
       NFRM=999999                                                      THERMO 126
       IEND=0                                                           THERMO 127
       JSTOP=0                                                          THERMO 128
      START=0.0                                                         THERMO 129
       STOP=99999999.                                                   THERMO 130
      IPRINT=1                                                          THERMO 131
      TISAVE=0.0                                                        THERMO 132
       IVALID=2                                                         THERMO 133
       PCT=.5                                                           THERMO 134
       PCT=.75                                                          THERMO 135
       ICAL=0                                                           THERMO 136
       IPLOT=0                                                          THERMO 137
      ITAPE=0                                                           THERMO 138
      IPL2D=.FALSE.                                                     THERMO 139
      IPL3D=.FALSE.                                                     THERMO 140
      ITPT =0                                                           THERMO 141
       IPONT=-1                                                         THERMO 142
        IP3DL1=1                                                        THERMO 143
        IP3DL2=100                                                      THERMO 144
        IP3DW1=1                                                        THERMO 145
        IP3DW2=100                                                      THERMO 146
        IP2DL1=1                                                        THERMO 147
        IP2DL2=100                                                      THERMO 148
        IP2DW1=1                                                        THERMO 149
        IP2DW2=100                                                      THERMO 150
       IPRL1=1                                                          THERMO 151
      IPRL2=100                                                         THERMO 152
      IPRW1=1                                                           THERMO 153
      IPRW2=100                                                         THERMO 154
       IPVL=58                                                          THERMO 155
      IPVL2=60                                                          THERMO 156
      IPVW=26                                                           THERMO 157
      IPVW2=64                                                          THERMO 158
      NPL3D=1                                                           THERMO 159
      NPL2D=1                                                           THERMO 160
      ITOP=11                                                           THERMO 161
       ICLASS=0                                                         THERMO 162
      ILINE=0                                                           THERMO 163
        UFOR=100.                                                       THERMO 164
       UBACK=1.                                                         THERMO 165
       VLEFT=1.                                                         THERMO 166
       VRIGHT=100.                                                      THERMO 167
      WBOT=0.                                                           THERMO 168
       WTOP=1000.                                                       THERMO 169
       THETA=.785                                                       THERMO 170
       UAXIS=1.                                                         THERMO 171
       VAXIS=1.                                                         THERMO 172
```

```
      UVPLNE=0.
      IFOR=100
      IBACK=1
      ILEFT=1
      IRIGHT=100
      ICNT30=-1
      IVIEW=1
      ICKSTR=1
      ICKSTP=0
C**** PRINT OUT ALL I/P CARDS
 10   CONTINUE
      CALL REPRNT
C**** READ I/P CARDS AND DETERMINE OPTIONS
   11 ITAP=1
      RBSAV=-999.
      IF(IFSEND.EQ.1.AND.ITSEND.EQ.1)END FILE 12
      IFSEND=1
      NEWPAS=1
      ICNT30=-1
      NFR=0
 12    CONTINUE
      READ(4,1002)KRD
      GO TO (15,16),ITAP
   15 IF(EOF(4))999,14,999
   16 IF(EOF(4))200,14,200
   14 CONTINUE
 1002  FORMAT(8A10)
      IF(KRD(1).NE.5HLABEL )GO TO 13
      DECODE(70,1003,KRD(2))ILAB,LABEL(1,ILAB),LABEL(2,ILAB)
 1003  FORMAT(I2,8X,2A10)
      GO TO 12
 13   CONTINUE
      DECODE(80,1000,KRD(1))KARD,IOPT,X1,X2,X3,X4
      ITAP=2

 1000  FORMAT(A4,6X,10I2,5F10.2)
      IF(KARD.EQ.4HTITL)GO TO 100
      IF(KARD.EQ.4HPLOT)GO TO 110
      IF(KARD.EQ.4HPRIN)GO TO 120
      IF(KARD.EQ.4HTAPE)GO TO 130
      IF(KARD.EQ.4HTIME)GO TO 140
      IF(KARD.EQ.4HDELE)GO TO 141
      IF(KARD.EQ.4HLIMI)GO TO 150
       IF(KARD.EQ.4HCLAS)GO TO 160
      IF(KARD.EQ.4HVALI)GO TO 170
      IF(KARD.EQ.4HCAL  )GO TO 180
       IF(KARD.EQ.4HCONV)GO TO 190
      IF(KARD.EQ.4HCENT)GO TO 192
       IF(KARD.EQ.4HTRAC)GO TO 194
       IF(KARD.EQ.4HMIN  )GO TO 196
       IF(KARD.EQ.4HMATF )GO TO 1940
       IF(KARD.EQ.4HTAIL )GO TO 198
      IF(KARD.EQ.4HEDIT)GO TO 1908
      IF(KARD.EQ.4HGO   )GO TO 200
       PRINT 2004,KRD
 2004  FORMAT(1H0,* THE PROGRAM DID NOT RECOGNIZE THE FOLLOWING CARD*/
     , 1X,8A10)
```

```
          GO TO 12                                          THERMO  230
  100     CONTINUE                                          THERMO  231
C****TITLE CAR  READ INPUT TITLE                            THERMO  232
          READ(4,1001)TITLE                                 THERMO  233
          IF(EOF(4))200,101,200                             THERMO  234
  101 CONTINUE                                              THERMO  235
 1001     FORMAT(8A10)                                      THERMO  236
          GO TO 12                                          THERMO  237
  110     CONTINUE                                          THERMO  238
C****  PLOT OPTION CARD                                     THERMO  239
          IPLOT=IOPT(1)                                     THERMO  240
          IJSUM=IOPT(10)                                    THERMO  241
          IF(IPLOT.EQ.3.ANL.X1.GT.0.0)WTOP=X1               THERMO  242
          IPL3D=.TRUE.                                      THERMO  243
          IF(IOPT(2).NE.0)IP3DL1=IOPT(2)                    THERMO  244
          IF(IOPT(3).NE.0)IP3DL2=IOPT(3)                    THERMO  245
          IF(IOPT(4).NE.0)IP3DW1=IOPT(4)                    THERMO  246
          IF(IOPT(5).NE.0)IP3DW2=IOPT(5)                    THERMO  247
          IF(IOPT(6).NE.0)NPL3D=IOPT(6)                     THERMO  248
           IVIEW=IOPT(7)                                    THERMO  249
          IPASS=-1                                          THERMO  250
          IF(IVIEW.LT.1.OR.IVIEW.GT.4)IVIEW=1               THERMO  251
          GO TO (1101,1102,1103,1104),IVIEW                 THERMO  252
 1101     IFOR=IP3DL2                                       THERMO  253
          IBACK=IP3DL1                                      THERMO  254
          ILEFT=IP3DW1                                      THERMO  255
          IRIGHT=IP3DW2                                     THERMO  256
          GO TO 1105                                        THERMO  257
 1102     IFOR=IP3DW2                                       THERMO  258
          IBACK=IP3DW1                                      THERMO  259
          ILEFT=IP3DL2                                      THERMO  260
          IRIGHT=IP3DL1                                     THERMO  261
          GO TO 1105                                        THERMO  262
 1103     IFOR=IP3DL1                                       THERMO  263
          IBACK=IP3DL2                                      THERMO  264
          ILEFT=IP3DW2                                      THERMO  265
          IRIGHT=IP3DW1                                     THERMO  266
          GO TO 1105                                        THERMO  267
 1104     IFOR=IP3DW1                                       THERMO  268
          IBACK=IP3DW2                                      THERMO  269
          ILEFT=IP3DL1                                      THERMO  270
          IRIGHT=IP3DL2                                     THERMO  271
 1105     CONTINUE                                          THERMO  272
          UFOR=IFOR                                         THERMO  273
          UBACK=IBACK                                       THERMO  274
          VLEFT=ILEFT                                       THERMO  275
          VRIGHT=IRIGHT                                     THERMO  276
          UAXIS=VLEFT                                       THERMO  277
          VAXIS=UBACK                                       THERMO  278
          GC TO 12                                          THERMO  279
  112     CONTINUE                                          THERMO  280
          GC TO 12                                          THERMO  281
  120      CONTINUE                                         THERMO  282
C****  PRINT OPTION CARD                                    THERMO  283
          IPRINT=IOPT(1)                                    THERMO  284
          IF(IOPT(7).NE.0)IPVL=IOPT(7)                      THERMO  285
          IF(IOPT(8).NE.0)IPVW=IOPT(8)                      THERMO  286
```

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              IF(IOPT(9).NE.0)IPVL2=IOPT(9)                              THERMO   287
             IF(IOPT(10).NE.0)IPVH2=IOPT(10)                             THERMO   288
             IF(IPRINT.EQ.1)GO TO 12                                     THERMO   289
             IF(IOPT(2).NE.0)IFRL1=IOPT(2)+1                             THERMO   290
             IF(IOPT(3).NE.0)IPRL2=IOPT(3)                               THERMO   291
             IF(IOPT(4).NE.0)IFRH1=IOPT(4)+1                             THERMO   292
             IF(IOPT(5).NE.0)IPRH2=IOPT(5)                               THERMO   293
              IF(IOPT(6).NE.0)NPRINT=IOPT(6)                             THERMO   294
              GO TO 12                                                   THERMO   295
       130    CONTINUE                                                   THERMO   296
       C**** TAPE OPTION CARD                                            THERMO   297
              ITAPE=IOPT(1)                                              THERMO   298
              IF(IOPT(2).NE.0)KSR=IOPT(2)                                THERMO   299
              ITSENO=IOPT(3)                                             THERMO   300
               IF(X1.GT..01)ONE=X1                                       THERMO   301
              GO TO 12                                                   THERMO   302
       140   CONTINUE                                                    THERMO   303
       C**** TIME CARD                                                   THERMO   304
             START=IOPT(1)*3600000.+IOPT(2)*60000.+IOPT(3)*1000.+IOPT(4)*10.    THERMO   305
           .  +IOPT(5)/10.                                               THERMO   306
             STOP= IOPT(6)*3600000.+IOPT(7)*60000.+IOPT(8)*1000.+IOPT(9)*10.    THERMO   307
           .  +IOPT(10)/10.                                              THERMO   308
              ICKSTR=1                                                   THERMO   309
              ICKSTP=0                                                   THERMO   310
              IF(STOP.GT.START)ICKSTP=1                                  THERMO   311
              IF(STOP.LT..01)STOP=999999999.                             THERMO   312
                IF(X1.GT..1)NFRM=X1                                      THERMO   313
              GO TO 12                                                   THERMO   314
       141   CONTINUE                                                    THERMO   315
       C***  DELETE CARD                                                 THERMO   316
             IF(IDEL.GE.29)GO TO 12                                      THERMO   317
             IDEL=IDEL+1                                                 THERMO   318
             TDELE(1,IDEL)=IOPT(1)*3600000.+IOPT(2)*60000.+IOPT(3)*1000.   THERMO   319
           . +IOPT(4)*10.+IOPT(5)/10.                                    THERMO   320
             TDELE(2,IDEL)=IOPT(6)*3600000.+IOPT(7)*60000.+IOPT(8)*1000.   THERMO   321
           . +IOPT(9)*10.+IOPT(10)/10.                                   THERMO   322
             GO TO 12                                                    THERMO   323
       150    CONTINUE                                                   THERMO   324
       C**** TOP CARD.  THIS CARD SETS THE LINE TO BE TOP OF PICTURE.    THERMO   325
              ITOP=IOPT(1)                                               THERMO   326
              GO TO 12                                                   THERMO   327
       C**** CLASSIFICATION CARD.  1=CONFIDENTIAL, 2=SECRET.             THERMO   328
       160   CONTINUE                                                    THERMO   329
              ICLASS=IOPT(1)                                             THERMO   330
              CALL SECURE(KRD,6)                                         THERMO   331
              ICLFRM=1                                                   THERMO   332
             GO TO 12                                                    THERMO   333
       C**** VALID DATA SWITCH CARD                                      THERMO   334
       170   CONTINUE                                                    THERMO   335
             IVALID=IOPT(1)                                              THERMO   336
             GO TO 12                                                    THERMO   337
                                                                         THERMO   338
       C**** THIS CARD SELECTS CALIBRATION FRAMES ONLY                   THERMO   339
       180    CONTINUE                                                   THERMO   340
              ICAL=IOPT(1)                                               THERMO   341
              GO TO 12                                                   THERMO   342
       C**** CONVERSION CARD. THIS CARD CONTAINS PROPER CONVERSION FACTOR    THERMO   343
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65 + 150 (4/22)

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      C    (CALIBRATION) TO CONVERT FROM COUNTS TO IRRADIANCE FOR A GIVEN
      C    FILTER,APERATURE,GAIN SETTING.

  190        CONTINUE
           IF=IOPT(1)+1
           IA=IOPT(2)+1
            IG=IOPT(3)
           IF(IA.GT.8.OR.IF.GT.8.OR.IG.GT.4)GO TO 12
            CONV(IF,IA,IG)=X1
            GO TO 12

      C**** CENTER CARD.  THIS CARD SPECIFIES CENTER LINE, WORD AND ANGULAR
      C    RESOLUTION OF PICTURE CELL.
  192       CONTINUE
            ILCENT=IOPT(1)
           IWCENT=IOPT(2)
            RESLIN=X1
            RESWD=X2
           GO TO 12

      C**** TRACK POINT CARD.  THIS CARD SPECIFIES TAPE CONTAINING TRACK POINT
      C    TO BE READ. (TAPE 10)
  194      CONTINUE
            ITRK=IOPT(1)
           ITPT = IOPT(2)
           IF(ITPT.EQ.1) IT10 =24
            ABIAS=X1
            EBIAS=X2
            GO TO 12

  1940      CONTINUE
      C**** MATRIX CARD. THIS CARD SPECIFIES MATRIX TO BE OUTPUT

           IMTX=IOPT(1)
           DLEFT=X1
            DRIGHT=X2
            NFRMTX=X3
           IF(ABS(X1).LT..000001)DLEFT=-.7
           IF(ABS(X2).LT..000001)DRIGHT=10.0
           IFIND=IOPT(4)
            IF(NFRMTX.EQ.0)NFRMTX=4
           RBCELL=IOPT(3)
            IFEET=IOPT(2)
            IFRMTX=IOPT(5)
           .GO TO 12

      C**** THIS CARD CHANGES THE MINIMUM VALUE FOR WHICH TO EDIT THE
      C   PICTURE.  IF THE MAXIMUM VALUE IN THE PICTURE IS LESS THAN THIS
      C   VALUE, THEN THE PICTURE WILL NOT BE PLOTTED. (DEFAULT MINIMUM=20)
  196       CONTINUE
            MNVAL=X1
            GO TO 12
      C**** EDIT CARD. THIS CARD SETS COUNT VALUES FOR EDITING NOISE SPIKES
      C     OR TURNS OFF EDIT IF REQUESTED.

  1988      CONTINUE
            IEDT=IOPT(1)
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               IF(X1.GT.1.0)IEDLP=X1                                          THERMO    401
               IF(X2.GT.1.0)IEDCWN=X2                                         THERMO    402
               IF(ABS(X4).GT..0001)PCT=X4                                     THERMO    403
               IBK=X3                                                         THERMO    404
               GO TO 12                                                       THERMO    405
        198    CONTINUE                                                       THERMO    406
        C**** THIS CARD SPECIFIES AZ, EL OF TAIL PIPE AND TRACK POINT. ( ASSUME THERMO  407
        C    NOT READ TAPE 10)                                                THERMO    408
               ITRK=-1                                                        THERMO    409
               ATP=X1                                                         THERMO    410
               ETP=X2                                                         THERMO    411
               ATRK=X3                                                        THERMO    412
               ETRK=X4                                                        THERMO    413
               GO TO 12                                                       THERMO    414
        200   CONTINUE                                                        THERMO    415
               IHOVER=10HVER DEG                                              THERMO    416
              IHOHOR=10HHOR DEG                                               THERMO    417
               IF(IFEET.EQ.0)GO TO 201                                        THERMO    418
              IHOVER=10HVER FT                                                THERMO    419
              IHOHOR=10HHOR FT                                                THERMO    420
        201   CONTINUE                                                        THERMO    421
              IF(ITAPE.NE.2)GO TO 202                                         THERMO    422
              CALL PACKED                                                     THERMO    423
               GO TO 203                                                      THERMO    424
        202   CONTINUE                                                        THERMO    425
               CALL GETPIC                                                    THERMO    426
        203   CONTINUE                                                        THERMO    427
              IF(IEND.GT.0)GO TO 999                                          THERMO    428
               NFR=NFR+1                                                      THERMO    429
               IF(NFR.GT.NFRM)GO TO 11                                        THERMO    430
              IF(JSTOP.GT.0)GO TO 11                                          THERMO    431
              IF(IDEL.EQ.0)GO TO 2044                                         THERMO    432
              DO 204 I=1,IDEL                                                 THERMO    433
              IF(T1.LT.TDELE(1,I).OR. T1.GT.TDELE(2,I)) GO TO 204             THERMO    434
               ICNT30=ICNT30+1                                                THERMO    435
               GO TO 201                                                      THERMO    436
        204    CONTINUE                                                       THERMO    437
        2044   CONTINUE                                                       THERMO    438
               DIFF=(T2-T1)/1000.                                             THERMO    439
              TTDIFF=(T1-T1SAVE)/1000.                                        THERMO    440
              T1SAVE=T2                                                       THERMO    441
        C**** FIND PROPER CONVERSION FACTOR                                   THERMO    442
               IF=IBEFOR(2)+1                                                 THERMO    443
               IA=IBEFOR(3)+1                                                 THERMO    444
               IG=IBEFOR(4)                                                   THERMO    445
               IC=IBEFOR(5)                                                   THERMO    446
               CONVF=CONV(IF,IA,IG)                                           THERMO    447
               IF(ICLASS.EQ.0)GO TO 2045                                      THERMO    448
              LABEL(2,5)=IFILT(IF)                                            THERMO    449
        2045   CONTINUE                                                       THERMO    450
                                                                              THERMO    451
              CALL IHMS(T1,IH1,IM1,SEC1)                                      THERMO    452
              CALL IHMS(T2,IH2,IM2,SEC2)                                      THERMO    453
               IF(IG.EQ.1)GO TO 2046                                          THERMO    454
              LABEL(1,14)=10H                                                 THERMO    455
              LABEL(2,14)=10H                                                 THERMO    456
              IF(IG.EQ.2)LABEL(1,14)=10HGAIN = X1                             THERMO    457
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            IF(IG.EQ.3)LABEL(1,14)=10HGAIN = X10                                  THERMO    458
      2046   CONTINUE                                                             THERMO    459
            IF(IC.EQ.0)NPICT=NPICT+1                                              THERMO    460
            ENCODE (40,2005,LABEL1(1,1))IH1,IM1,SEC1,NPICT                        THERMO    461
      2005  FORMAT(*TIME*,I3,I2,F7.3,4X,*FRAME NO.*,I6,5X)                        THERMO    462
C**** PRINT AS PER I/P CPTION                                                     THERMO    463
            IF(IPRINT.EQ.0)GC TO290                                               THERMO    464
            ICARIG=1H                                                             THERMO    465
            IF(NEWPAS.EQ.1)ICARIG=1H0                                             THERMO    466
           IF(NEWPAS.EQ.1)PRINT 1998, ICARIG,TITLE                                THERMO    467
           NEWPAS=0                                                               THERMO    468
      1998  FORMAT(A1,20X,8A10//                                                  THERMO    469
           .9X,*FRAME*,9X,*TIME   TIME    TIME F  A  G  C  V  LT+  LTH*,3X,       THERMO    470
           .*C1  C1  C1   C2  C2  C2  MAX MAX MAX AVG   AZ OF   EL OF*/ 8X,       THERMO    471
           . *NUMBER*,7X*BEFORE     DIFF     BET  I  P  N  A  A  BEF  AFT*,2X,    THERMO    472
           .*CNT  LN  WD  CNT  LN  WD  CNT   LN  WD CNT     MAX      MAX*/10X,    THERMO    473
           .  13X,*PICT*,12X,*PICT  L          L  L*,57X,*CELL    CELL*)          THERMO    474
           IF(IPRINT.NE.1)PRINT 1999                                              THERMO    475
      1999  FORMAT(1X)                                                            THERMO    476
            IPC=1H                                                                THERMO    477
             IF(.NOT.IPL3D)GC TO 205                                              THERMO    478
             IF(MOD((ICNT3D+1),NPL3D).EQ.0)IPC=1H*                                THERMO    479
      205   CONTINUE                                                              THERMO    480
C**** DETERMINE BACKGROUND LEVEL FOR EDITING                                       THERMO    481
            DO 2059 I=10001,10060                                                 THERMO    482
      2059    IPICT(I)=0                                                          THERMO    483
            DO 2060 I=2,100                                                       THERMO    484
           DO 2060 J=1,100                                                        THERMO    485
            IF(IPIC(I,J).LE.E)GO TO 2060                                          THERMO    486
           IF(IPIC(I,J).GE.200)GO TO 2060                                         THERMO    487
           IF(IPIC(I,J).LT.IPIC(I-1,J))GO TO 2060                                 THERMO    488
            INDX=IPIC(I,J)/10+10001                                               THERMO    489
           IPICT(INDX)=IPICT(INDX)+IPIC(I,J)                                      THERMO    490
           IPICT(INDX+20)=IPICT(INDX+20)+1                                        THERMO    491
      2060   CONTINUE                                                             THERMO    492
C**** SCAN FREQUENCY IN CELLS TO DETERMINE CELL WITH GREATEST OCCURRENCE           THERMO    493
            NUMVAL=0                                                              THERMO    494
           ISUM=10                                                                THERMO    495
            DO 2065 I=10001,10020                                                 THERMO    496
             IF(IPICT(I+20).EG.0)GO TO 2065                                       THERMO    497
           IPICT(I+40)=IPICT(I)/IPICT(I+20)                                       THERMO    498
             IF(NUMVAL.GT.IPICT(I+20))GO TO 2065                                  THERMO    499
           NUMVAL=IPICT(I+20)                                                     THERMO    500
             ISUM=IPICT(I+40)                                                     THERMO    501
      2065   CONTINUE                                                             THERMO    502
            DO 2066 I=10001,10060                                                 THERMO    503
            IPICT(I)=-1                                                           THERMO    504
      2066   CONTINUE                                                             THERMO    505
            IEDCNT=MAX0(4*ISUM,30)                                                THERMO    506
            IADD=PCT*ISUM                                                         THERMO    507
            MINEDT=ISUM+MAX0(IADD,3)                                              THERMO    508
            IF(IEDUP.NE.0)IEDCNT=IEDUP                                            THERMO    509
            IF(IEDOWN.NE.0)MINEDT=IEDOWN                                          THERMO    510
           MAXCNT=0                                                               THERMO    511
            MXCNT1=0                                                              THERMO    512
            MXCNT2=0                                                              THERMO    513
            ISUM=0                                                                THERMO    514
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              NSUM=0                                                                        THERMO
              DO 206 I=1,100                                                                THERMO
              I1=MAX0(I-1,1)                                                                THERMO
               I2=MIN0(I+1,100)                                                             THERMO
              DO 206 J=1,100                                                                THERMO
        C**** EDIT NOISE SPIKES IF REQUESTED                                                THERMO
              IF(IEDT.EQ.0)GO TC 2054                                                       THERMO
              MAXADJ=0                                                                      THERMO
              J1=MAX0(J-1,1)                                                                THERMO
              J2=MIN0(J+1,100)                                                              THERMO
              MAXADJ=MAX0(IPIC(I1,J),IPIC(I2,J),IPIC(I,J1),IPIC(I,J2))                      THERMO
              IF(IPIC(I,J).LT.3*MAXADJ)GO TO 2047                                           THERMO
              IPIC(I,J)=MAXADJ                                                              THERMO
              GO TO 2053                                                                    THERMO
        2047   CONTINUE                                                                     THERMO
              IF(IPIC(I,J).LT.(MINEDT+IEDCNT))GO TO 2053                                    THERMO
               IF(J.EQ.100)GO TO 2048                                                       THERMO
              IF(IPIC(I,J+1).GT.MINEDT)GO TO 2053                                           THERMO
              IF(J.NE.1)GO TO 2048                                                          THERMO
              IPIC(I,J)=IPIC(I,J+1)                                                         THERMO
               GO TO 2053                                                                   THERMO
        2048   IF(IPIC(I,J-1).GT.MINEDT)GO TO 2053.                                         THERMO
              IF(J.NE.100)GO TO 2050                                                        THERMO
              IPIC(I,J)=IPIC(I,J-1)                                                         THERMO
              GO TO 2053                                                                    THERMO
        2050  IPIC(I,J)=(IPIC(I,J-1)+IPIC(I,J+1))/2.                                        THERMO
        2053   CONTINUE                                                                     THERMO
        2054   CONTINUE                                                                     THERMO
              NVALUE=IPIC(I,J)                                                              THERMO
               IF(NVALUE.LE.0)GC TO  206                                                    THERMO
              ILX=J+ITOP                                                                    THERMO
              IF(ILX.LT.40.OR.ILX.GT.70)GO TO 2056                                          THERMO
              IF(I.GT.49)GO TO 2055                                                         THERMO
               MXCNT1=MAX0(MXCNT1,NVALUE)                                                   THERMO
               IF(MXCNT1.NE.NVALUE)GO TO 2056                                               THERMO
               MXW1=I                                                                       THERMO
                MXL1=J+ITOP                                                                 THERMO
               GO TO 2056                                                                   THERMO
        2055    MXCNT2=MAX0(MXCNT2,NVALUE)                                                  THERMO
               IF(MXCNT2.NE.NVALUE)GO TO 2056                                               THERMO
               MXW2=I                                                                       THERMO
               MXL2=J+ITOP                                                                  THERMO
        2056    CONTINUE                                                                    THERMO
               IF(I.EQ.1.OR.I.EC.100)GO TO 2057                                             THERMO
              IF(NVALUE.GT.150)GO TO 2057                                                   THERMO
              IF(IPIC(I,J).LE.IFIC(I-1,J).OR.IPIC(I,J).LE.IPIC(I+1,J))GO TO 2057 THERMO
                ISUM=ISUM+IPIC(I,J)                                                         THERMO
               NSUM=NSUM+1                                                                  THERMO
        2057   CONTINUE                                                                     THERMO
              MAXCNT=MAX0(MAXCNT,NVALUE)                                                    THERMO
               IF(MAXCNT.NE.NVALUE)GO TO 206                                                THERMO
              IMXL=ILX                                                                      THERMO
              IMXW=I                                                                        THERMO
        206    CONTINUE                                                                     THERMO
              LV1=IPVL-ITOP+1                                                               THERMO
               IF(LV1.LT.1)LV1 =1                                                           THERMO
              LV2=IPVL2-ITOP+1                                                              THERMO
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          GO TO 207                                                          THERMO   572
          IF(ICAL.EQ.1.OR.IC.EQ.1)GO TO 207                                  THERMO   573
                                                                             THERMO   574
           MXW1=IPVW                                                         THERMO   575
           MXW2=IPVW2                                                        THERMO   576
          MXL1=LV1                                                           THERMO   577
          MXL2=LV2                                                           THERMO   578
          MXCNT1=IPIC(IPVW,LV1)                                              THERMO   579
           MXCNT2=IPIC(IPVW2,LV2)                                            THERMO   580
  207     CONTINUE                                                           THERMO   581
           IF(NSUM.NE.0)ISUM=ISUM/NSUM                                       THERMO   582
          IADD=PCT*ISUM                                                      THERMO   583
           IBKGR=ISUM+MAX0(IADD,3)                                           THERMO   584
          IF(IBK.GT.0)IBKGR=IBK                                              THERMO   585
          MINVAL=4*ISUM                                                      THERMO   586
          IF(MINVAL.LE.0)MINVAL=1                                            THERMO   587
          IF( MNVAL.NE.0)MINVAL=MNVAL                                        THERMO   588
           ISUM1=0                                                           THERMO   589
          ISUMH=10HSUM =                                                     THERMO   590
           IF(MAXCNT.LT.MINVAL)IPC=1H                                        THERMO   591
          AZMAX=(IMXW-IWCENT)*RESWD                                          THERMO   592
          ELMAX=(ILCENT-IMXL)*RESLIN                                         THERMO   593
          PRINT 2000,NPICT,IH1,IM1,SEC1,DIFF,TTDIFF,                         THERMO   594
         .(IBEFOR(I),I=2,7),IAFTER(7),MXCNT1,MXL1,MXW1,MXCNT2,MXL2,MXW2,     THERMO   595
         .MAXCNT,IMXL,IMXW,ISUM,AZMAX,ELMAX,INPT,IPO                         THERMO   596
 2000     FORMAT(I10,4X,2I3,F7.3,2F8.3,5I3,2I5,I5,2I4,I5,2I4,I5,3I4,2F8.3,   THERMO   597
         . I4,1X,A1)                                                         THERMO   598
          ILINE=ILINE+1                                                      THERMO   599
          IF(IPRINT.LT.2)GO TO 240                                           THERMO   600
          IPCNT=IPCNT+1                                                      THERMO   601
          IF(MOD(IPCNT,NPRINT).NE.0) GO TO 240                               THERMO   602
          IPPR2=IPRL2-ITCP+1                                                 THERMO   603
          IPPR1=IPRL1-ITOP+1                                                 THERMO   604
          IF(IPPR1.LT.1)IPPR1=1                                              THERMO   605
          IF(IPPR2.LT.IPPR1)IPPR2=IPPR1                                      THERMO   606
          DO 230 I=IPPR1,IPPR2                                               THERMO   607
          KK=I-1+ITOP                                                        THERMO   608
          PRINT 2002,KK                                                      THERMO   609
          IF(IPRINT.NE.3)GO TO 215                                           THERMO   610
           DO 210 JJ=IPRW1,IPRW2                                             THERMO   611
          XPICT(JJ)=IPIC (JJ,I)*CONVF                                        THERMO   612
  210     CONTINUE                                                           THERMO   613
          PRINT 2003,(XPICT(JJ),JJ=IPRW1,IPRW2)                              THERMO   614
 2003      FORMAT(1X,10E12.4)                                                THERMO   615
          GO TO 230                                                          THERMO   616
  215     CONTINUE                                                           THERMO   617
           PRINT 2001,(IPIC(JJ,I),JJ=IPRW1,IPRW2)                            THERMO   618
 2002      FORMAT(* LINE=*,I5)                                               THERMO   619
 2001      FORMAT(25I5)                                                      THERMO   620
          ILINE=ILINE+(IPRW2-IPRW1)/25+2                                     THERMO   621
          IF(ILINE.LT.72)GO TO 225                                           THERMO   622
          ILINE=0                                                            THERMO   623
          IF(I.NE.IPRL2)PRINT 1990,TITLE                                     THERMO   624
  225      CONTINUE                                                          THERMO   625
  230     CONTINUE                                                           THERMO   626
  240     CONTINUE                                                           THERMO   627
           RESLFT=RESLIN                                                     THERMO   628
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      RESWFT=RESWD
      ITR=0
      SR=0
      IF(ITRK.LE.0)GO TO 3005
       ATP=0.0
       ETP=0.0
 3001   READ(10)(TAP10(I),I=1,IT10)
      IF(EOF(10))3045,3669,3045
 3669 IF(IOCHEC(10))3001,3569,3001
 3569 CONTINUE
      IF(TAP10(1).LT.T1)GO TO 3001
      IF(TAP10(1).GT.T2)GO TO 3017
      ATP=TAP10(13)+ABIAS
       ETP=TAP10(14)+EBIAS
       IF(ATP.GT.-90.)GC TO 3014
       ATP=0.0
       ETP=0.0
 3014   CONTINUE
      ATRK=TAP10(16)+ABIAS
      ETRK=TAP10(17)+EBIAS
       ITR=1
      LIN9=LIN9+1
      CALL IHMS(TAP10(1),IHVCO,IMVCO,SECVCO)
      R8=TAP10(18)
      DA=-TAP10(14)
      SR=TAP10(15)
 2006 FORMAT(*RANGE =*,F9.0,* FT.*,*ASPECT ANG=*,F5.0,* DEG*,
     . *DEP ANGLE=*,F6.2,* DEG*)
      IF(SR.LT.10.0)GO TO 3015
 3005   CONTINUE
       IF(IFEET.EQ.0)GO TO 3006
       RESLFT=SR*SIN(RESLIN*.017453293)
      RESWFT=SR*SIN(RESWD*.017453293)
 3006   CONTINUE
       ILTP=-ETP/RESLIN+ILCENT-ITOP+SIGN(.5,-ETP)
       IWTP=ATP/RESWD+IWCENT+SIGN(.5,ATP)
C**** IF ITRK.EQ.2 USE MAX AGA TO FIND TAIL PIPE LOCATION.
       IF(IABS(ITRK).NE.2)GO TO 3003
 3015  CONTINUE
      IF(ITRK.LT.0)GO TO 3017
      ATRK=TAP10(3)
      ETRK=TAP10(4)
 3017   CONTINUE
       LEVEL=.25*(MAXCNT-ISUM)+ISUM
       ILMXTP=IMXL-ITOP
      IWMXTP=IMXW
       DO 3002 I=1,100
       IF(IPIC(IWMXTP,ILMXTP).LT.LEVEL)GO TO 3004
      IWMXTP=IWMXTP-1
       IF(IWMXTP.LE.2)GC TO 3003
 3002  CONTINUE
        GO TO 3003
 3004  CONTINUE
       ILTP=ILMXTP
      IWTP=IWMXTP
      ATP=(IWTP-IWCENT)*RESWD
      ETP=ELMAX
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            IF(ITRK.LT.J)GO TO 3003                                THERMO   686
            DA=-ETP                                                THERMO   687
      3003    CONTINUE                                             THERMO   688
            RADTP=-9.99999                                         THERMO   689
C**** FIND MATRIX SIZE IF REQUESTED                                THERMO   690
            ENCODE (60,2006,LABEL1(1,3)) SR,RB,DA                  THERMO   691
            JEND=100                                               THERMO   692
            IF(SR.LT.10.)LABEL1(2,3)=10HNOT AVAIL.                 THERMO   693
            IF(TAP10 (1).GE.T1.AND.TAP10 (1).LE.T2)GO TO 3013      THERMO   694
            DO 3020 I=3,6                                          THERMO   695
            LABEL1(1,I)=10H                                        THERMO   696
            LABEL1(2,I)=10H                                        THERMO   697
      3020    CONTINUE                                             THERMO   698
      3013    CONTINUE                                             THERMO   699
            IPR=11111                                              THERMO   700
C***        PRINT 9876,IFIND,ILTP,INTP,IBKGR,IPR                   THERMO   701
            IF(IFIND.EQ.0)GO TO 3042                               THERMO   702
            ILTPM2=ILTP-2                                          THERMO   703
            ILTPP2=ILTP+2                                          THERMO   704
            IF(ILTP.LT.3)ILTPM2=ILTP                               THERMO   705
            IF(ILTP.GT.98)ILTPP2=ILTP                              THERMO   706
            NLEFT=INTP+DLEFT/RESHFT                                THERMO   707
            IXCEL=MAX0(NLEFT,1)                                    THERMO   708
            IXCEL2=IXCEL+24                                        THERMO   709
            IPR=22222                                              THERMO   710
C***        PRINT 9876,IXCEL,IXCEL2,ILTPP2,ILTPM2,IBKGR,IPR        THERMO   711
            DO 3041 I=1,4                                          THERMO   712
            ICNT=0                                                 THERMO   713
            NFRMTX=I                                               THERMO   714
            IF(IXCEL2.GT.100)GO TO 3042                            THERMO   715
            JJJ=0                                                  THERMO   716
            DO 3040 J=IXCEL,IXCEL2                                 THERMO   717
            JJJ=JJJ+1                                              THERMO   718
            IF(J.LT.INTP)GO TO 3039                                THERMO   719
            DO 3038 MMM=ILTPM2,ILTPP2                              THERMO   720
            IF(IPIC(J,MMM).GT.IBKGR)GO TO 3039                     THERMO   721
      3038    CONTINUE                                             THERMO   722
            ICNT=ICNT+1                                            THERMO   723
            IF(ICNT.GE.5)JEND=J                                    THERMO   724
            IPR=33333                                              THERMO   725
C***        PRINT 9876,ILTP,INTP,ICNT,JEND,IBKGR,IPR               THERMO   726
      9876    FORMAT(1X,10I7)                                      THERMO   727
            IF(ICNT.GT.5)GO TO 3042                                THERMO   728
            GO TO 3040                                             THERMO   729
      3039    CONTINUE                                             THERMO   730
            ICNT=0                                                 THERMO   731
      3040    CONTINUE                                             THERMO   732
            IXCEL=IXCEL2+1                                         THERMO   733
            IXCEL2=IXCEL+26                                        THERMO   734
      3041    CONTINUE                                             THERMO   735
      3042    CONTINUE                                             THERMO   736
            IF(ICNT.GT.5.AND.JJJ.LT.7)NFRMTX=NFRMTX-1              THERMO   737
            IF(ILTP.LT.1.OR.ILTP.GT.100)GO TO 3007                 THERMO   738
            IF(INTP.LT.1.OR.INTP.GT.100)GO TO 3007                 THERMO   739
            RADTP=IPIC (INTP,ILTP)*CONVF                           THERMO   740
      3007  CONTINUE                                               THERMO   741
            IF(ITPT.NE.1) GO TO 3008                               THERMO   742
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            IF(SR.LT.10.0)GO TO 3008                                    THERMO   743
            ATRK=ATP+TAP10(23)                                          THERMO   744
            ETRK=ETP+TAP10(24)                                          THERMO   745
            XTRK=SR*ATAN(TAP10(23)*.0174532921)                         THERMO   746
            YTRK=SR*ATAN(TAP10(24)*.017453292)                          THERMO   747
             MOVHOR=TAP10(23)/RESND+SIGN(.5,TAP10(23))                  THERMO   748
            MOVVER=TAP10(24)/RESLIN +SIGN(.5,TAP10(24))                 THERMO   749
            ILTRK=ILTP-MOVVER                                           THERMO   750
            INTRK=INTP+MOVHOR                                           THERMO   751
             GO TO 3000                                                 THERMO   752
      3008  CONTINUE                                                    THERMO   753
             ILTRK=-ETRK/RESLIN+ILCENT-ITOP+SIGN(.5,-ETRK)              THERMO   754
            INTRK=ATRK/RESND+INCENT+SIGN(.5,ATRK)                       THERMO   755
      3000   CONTINUE                                                   THERMO   756
            RADTRK=-9.99999                                             THERMO   757
             IF(ILTRK.LT.1.OR.ILTRK.GT.100)GO TO 3009                   THERMO   758
            IF(INTRK.LT.1.OR.INTRK.GT.100)GO  TO 3009                   THERMO   759
             RADTRK=IPIC(INTRK,ILTRK)*CONVF                             THERMO   760
      3009   CONTINUE                                                   THERMO   761
            AZAG=AZMAX                                                  THERMO   762
            ELAG=ELMAX                                                  THERMO   763
             RADAG=IPIC(IMXH,IMXL-ITOP)*CONVF                           THERMO   764
      3010  FORMAT(1H1,6X,*TIPE*,7X,*TIME     REL     DEP    SLANT*,8X,*TAIL PIPE THERMO   765
           . *,15X,*TRACK POINT*,12X,*MAX AGA POINT*/                   THERMO   766
           .8X,*AGA*,8X,*VCO*,9X,*BR     ANG    RANGE*,3(*     AZIM     ELEV     IR THERMO   767
           .RAD*)/ 48X,3(*(BS)     (BS)     *,9X))                      THERMO   768
      3011   FORMAT(1X,I2,I3,F5.1,2I3,F5.1,2F7.1,F8.0,3(2F8.2,F9.5))    THERMO   769
                                                                        THERMO   770
                                                                        THERMO   771
      C**** FLOT MATRIX CONTAINING TRACK POINT IF REQUESTED.            THERMO   772
            ISUM2=0                                                     THERMO   773
            NLEFT=INTP+DLEFT/RESWFT                                     THERMO   774
             IF(NLEFT.LT.1)NLEFT=1                                      THERMO   775
            NRIGHT=INTP+DRIGHT/RESWFT                                   THERMO   776
            NABOVE=(DABOVE/(DABOVE-DBELOW))*30.                         THERMO   777
            IPMTX=0                                                     THERMO   778
            ISLEFT=NLEFT                                                THERMO   779
            ISRITE=NLEFT+NFRMTX*27-2                                    THERMO   780
            IBOVE=ILTP-NABOVE                                           THERMO   781
            IBELOW=IBOVE+29                                             THERMO   782
             IF(IMTX.EQ.0)GO TO 4016                                    THERMO   783
            IMXCT=IMXCT+1                                               THERMO   784
             IF(MOD(IMXCT,IMTX).NE.0)GO TO 4016                         THERMO   785
            RBDIFF= ABS(RB-RBSAV)                                       THERMO   786
             IF(RBDIFF.LT.RBCELL)GO TO 4016                             THERMO   787
             IF (IPC.NE.1H*)GC TO 4016                                  THERMO   788
            IF(ATP.LT.-10.0)GC TO 3046                                  THERMO   789
            RBSAV=RB                                                    THERMO   790
             IF(IPRMTX.EQ.0)GC TO 3012                                  THERMO   791
             IPR=44444                                                  THERMO   792
      C***  PRINT 9876,ILTP,INTP,IBKGR,JEND,NLEFT,IPR                   THERMO   793
            CALL PRTMTX                                                 THERMO   794
             IPMTX=1                                                    THERMO   795
             GO TO 4016                                                 THERMO   796
      3012   CONTINUE                                                   THERMO   797
            IPMTX=1                                                     THERMO   798
             IGELLX=NLEFT-1                                             THERMO   799
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          CALL BIGV                                                    THERMO  800
          IXLEFT=74                                                    THERMO  801
          IYTOP=962                                                    THERMO  802
          IYBOT=62                                                     THERMO  803
           IFRMTX=1                                                    THERMO  804
          CALL FRAMEV(3)                                               THERMO  805
           CALL CLASS(1)                                               THERMO  806
            XX=IBKGR*CONVF                                             THERMO  807
          CALL PRINTV(-32,32HNOTE-SLASHED CELLS ARE LESS THAN    ,20,20)  THERMO  808
          CALL AFRNTV(0,-15,10,IHOVER,4,587)                           THERMO  809
           CALL PRINTV(10,IPOMOR,400,38)                               THERMO  810
           IF(CONVF.NE.1.0)                                            THERMO  811
         . CALL PRINTV(-24,24HIR UNITS = W/(CMSQ*SR)    ,400,960)      THERMO  812
           CALL LABLV(XX,284,20,-5,1,5)                                THERMO  813
           XX=IH1*100.+IM1                                             THERMO  814
           CALL PRINTV(-5,5HTIME= ,700,20)                             THERMO  815
           CALL LABLV(XX,750,20,4,1,4)                                 THERMO  816
           CALL LABLV(SEC1,782,20,6,1,2)                               THERMO  817
          CALL LINEV(IXLEFT,IYBOT,IXLEFT,IYTOP)                        THERMO  818
    C**** LABEL LEFT SIDE OF MATRIX                                    THERMO  819
           IY=IYTOP                                                    THERMO  820
           ICELY=NABOVE                                                THERMO  821
          IX=20                                                        THERMO  822
           DO 3050 I=1,30                                              THERMO  823
             XX=ICELY*RESLFT                                           THERMO  824
           ICELY=ICELY-1                                               THERMO  825
           CALL LABLV(XX,IX,IY-15,5,1,2)                               THERMO  826
          IY=IY-30                                                     THERMO  827
     3050  CONTINUE                                                    THERMO  828
     3060  CONTINUE                                                    THERMO  829
          IX=IXLEFT                                                    THERMO  830
           N=3                                                         THERMO  831
     3061  CONTINUE                                                    THERMO  832
          ILNEXT=0                                                     THERMO  833
          DO 3090 I=N,27                                               THERMO  834
          IF(ICELLX.GT.NRIGHT)GO TO 4000                               THERMO  835
          IY=IYTOP-12                                                  THERMO  836
    C**** PUT IRRADIANCE VALUES IN VERTICAL CELLS IF IN PICTURE        THERMO  837
           ICELLY=ILTP-NABOVE                                          THERMO  838
          DO 3065 J=1,30                                               THERMO  839
           IF(ITPT.EQ.0)GO TO 3063                                     THERMO  840
          IF(ITPT.EQ.1.AND.TAP10(24).LT.-99.0)GO TO 3063               THERMO  841
    C**** CHECK IF CELL IS TRACK POINT                                 THERMO  842
           IF(ICELLX.NE.INTFK.OR.ICELLY.NE.ILTRK)GO TO 3063            THERMO  843
           CALL POINTV(IX+37,IY+9,6,IDUM)                              THERMO  844
           CALL POINTV(IX+37,IY+9,6,IDUM)                              THERMO  845
           CALL POINTV(IX+32,IY+9,6,IDUM)                              THERMO  846
           CALL POINTV(IX+32,IY+9,6,IDUM)                              THERMO  847
           CALL POINTV(IX+27,IY+9,6,IDUM)                              THERMO  848
           CALL POINTV(IX+27,IY+9,6,IDUM)                              THERMO  849
           CALL POINTV(IX+22,IY+9,6,IDUM)                              THERMO  850
           CALL POINTV(IX+22,IY+9,6,IDUM)                              THERMO  851
           CALL POINTV(IX+37,IY+3,6,IDUM)                              THERMO  852
           CALL POINTV(IX+37,IY+3,6,IDUM)                              THERMO  853
           CALL POINTV(IX+37,IY-2,6,IDUM)                              THERMO  854
           CALL POINTV(IX+37,IY-2,6,IDUM)                              THERMO  855
           CALL POINTV(IX+37,IY-7,6,IDUM)                              THERMO  856
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      CALL POINTV(IX+37,IY-7,0,IDUM)
3063  CONTINUE
      IF(ICELLX.LT.1.OR.ICELLX.GT.100)GO TO 3068
      IF(ICELLY.LT.1.OR.ICELLY.GT.100)GO TO 3068
       IPX=IPIC(ICELLX,ICELLY)
       XX=IPX*CONVF
       IF(IPX.GT.IBKGR)GO TO 3064
       IXX=IX+38
       IF(IXX.GT.1023)IXX=1022
        CALL LINEV(IX,IY-18,IXX  ,IY+12)
       IF(IPX.GE.0)GO TC 3066
       CALL LINEV(IXX,IY-18,IX,IY+12)
       GO TO 3066
3064    CONTINUE
      ISUM2=ISUM2+IPX
       IF(IPX.GE.1023)ISUMM=10HSUM GT
      IE=ALOG10(XX)
      NL=1
      IF(IE.LT.1)GO TO 3066
       IE=0
       NL=4
       GC TO 3067
3066    CONTINUE
       IEE=IABS(IE)
        IE=IE-1
      XX=XX*10.**(IEE+1)
3067    CONTINUE
       IF(IPX.LT.1023)GC TO 3077
      CALL PRINTV(-4,4HXXXX ,IX+6,IY)
       GO TO 3068
3077    CONTINUE
      XE=IE
      CALL LABLV(XX,IX+6,IY,4,1,NL)
       CALL PRINTV(-1,1HE,IX+6,IY-12)
      CALL LABLV(XE,IX+14,IY-12,2,1,2)
3068    CONTINUE
      IY=IY-30
       ICELLY=ICELLY+1
3069   CONTINUE
      ICELLX=ICELLX+1
      IF(IX.NE.1)GO TO 3088
      IX=IX+35
      GO TO 3090
3088   CONTINUE
       IX=IX+38
       IF(I.EQ.27)IX=1023
      CALL LINEV(IX,IYBCT,IX,IYTOP)
       XX=(ICELLX-INTP)*RESWFT
       IF(MOD(IABS(ICELLX-INTP),2).NE.0)GO TO 3090
       IF(I.NE.27)GO TO 3089
       ILNEXT=1
       GO TO 3090
3089    CONTINUE
       CALL LABLV(XX,IX-10,IYBOT-12,6,1,3)
3090   CONTINUE
4000   CONTINUE
      IY=IYBOT
```

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            DO 4010 I=1,31                                                  THERMO   914
            CALL LINEV(IXLEFT,IY,IX,IY)                                     THERMO   915
            IY=IY+30                                                        THERMO   916
     4010   CONTINUE                                                        THERMO   917
            IF(ICELLX.GT.NRIGHT)GO TO 4015                                  THERMO   918
            IX=1                                                            THERMO   919
            IF(IFRMTX.GE.NFRMTX)GO TO 4015                                  THERMO   920
            IFRMTX=IFRMTX+1                                                 THERMO   921
             IXLEFT=2                                                       THERMO   922
            CALL FRAMEV(3)                                                  THERMO   923
             CALL LINEV(36,IYBOT,36,IYTOP)                                  THERMO   924
             IXX=3                                                          THERMO   925
             IF(ILNEXT.EQ.1)GC TO 4008                                      THERMO   926
             IF(MOD(IABS(ICELLX+1-INTP),2).NE.0)GO TO 4011                  THERMO   927
              XX=(ICELLX+1-INTP)*RESWFT                                     THERMO   928
             IXX=34                                                         THERMO   929
     4008    CONTINUE                                                       THERMO   930
             CALL LABLV(XX,IXX,IYBOT-12,5,1,2)                              THERMO   931
     4011    CONTINUE                                                       THERMO   932
             CALL CLASS(1)                                                  THERMO   933
             N=1                                                            THERMO   934
            GO TO 3061                                                      THERMO   935
      3045   CONTINUE                                                       THERMO   936
            ITRK=0                                                          THERMO   937
     3046    CONTINUE                                                       THERMO   938
             ATP=0.0                                                        THERMO   939
             ETP=0.0                                                        THERMO   940
     4015    CONTINUE                                                       THERMO   941
             IF(ISUM2.EQ.0)GO TO 4115                                       THERMO   942
            XSUM=ISUM2*CONVF                                                THERMO   943
            CALL PRINTV(-6,6HMATRIX,612,966)                                THERMO   944
             CALL PRINTV(10,ISUMM,668,966)                                  THERMO   945
             CALL LABLV (XSUM,748,966,-5,1,5)                               THERMO   946
              IF(IJSUM.EQ.0)GC TO 4115                                      THERMO   947
            IF(TAP10(1).LT.T1.OR.TAP10(1).GT.T2)GO TO 4115                  THERMO   948
            IF(SR.LT.10.0)GO TO 4115                                        THERMO   949
            CALL PRINTV(-14,14H =          W/SR  ,846,966)                  THERMO   950
            XSUMJ=XSUM*RESRAD*(SR*30.48)**2                                 THERMO   951
            CALL LABLV(XSUMJ,662,966,6,1,6)                                 THERMO   952
     4115   CONTINUE                                                        THERMO   953
             CALL SMALLV                                                    THERMO   954
     4016   CONTINUE                                                        THERMO   955
     250    CONTINUE                                                        THERMO   956
             IF(ILINE.GT.72)ILINE=0                                         THERMO   957
     C****  PLOT AS PER I/P OPTION                                          THERMO   958
            IF(IPLOT.EQ.0)GO TO 400                                         THERMO   959
             IF(.NOT.IPL3D)GO TO 300                                        THERMO   960
            ICNT3D=ICNT3D+1                                                 THERMO   961
            IF(MOD(ICNT3D,NPL3D).NE.0)GO TO 300                             THERMO   962
     C****  PLOT 3-D IMAGE OF PICTURE                                       THERMO   963
     C                                                                      THERMO   964
     C****  IF MAXIMUM COUNT IS LESS THAN EDIT COUNT (MINVAL), DO NOT PLOT. THERMO   965
             IF(MAXCNT.LT.MINVAL)GO TO 300                                  THERMO   966
            IF(IPLOT.EQ.2)WTOF=MAXCNT+100-MOD(MAXCNT,100)                   THERMO   967
            IPASS=-1                                                        THERMO   968
             CALL PLT3D                                                     THERMO   969
     C****  LABEL VERTICAL AXIS                                             THERMO   970
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      IX1=IW(1,1)                                          THERMO   971
      IY1=IW(2,1)                                          THERMO   972
      IY2=IW(2,2)                                          THERMO   973
      IDELY=(IY2-IY1)/10                                   THERMO   974
      WT=WTOP*CONVF                                        THERMO   975
      WB=WBOT*CONVF                                        THERMO   976
      DELX=WT/10.                                          THERMO   977
      IX=IX1-32                                            THERMO   978
      IY=IY1                                               THERMO   979
      NC=4                                                 THERMO   980
      LABVER=10HCOUNTS                                     THERMO   981
      NL=4                                                 THERMO   982
      IF(WT.GT.10)GO TO 251                                THERMO   983
      NC=6                                                 THERMO   984
      LABVER=10HW/(CM2*SR)                                 THERMO   985
      NL=1                                                 THERMO   986
      IX=IX-16                                             THERMO   987
  251 CONTINUE                                             THERMO   988
      XX=WB                                                THERMO   989
      DO 255 I=1,11                                        THERMO   990
      CALL LABLV(XX,IX,IY,NC,1,NL)                         THERMO   991
      CALL LABLV(XX,IX,IY,NC,1,NL)                         THERMO   992
      IY=IY+IDELY                                          THERMO   993
      XX=XX+DELX                                           THERMO   994
  255 CONTINUE                                             THERMO   995
C**** LABEL PLOT                                            THERMO   996
      IYY=(IY1+IY2)/2-65                                   THERMO   997
      CALL RITE2V(IX-20,IYY,1023,180,2,10,1,LABVER,NLAST)  THERMO   998
C**** PUT CLASSIFICATION ON PICTURE                         THERMO   999
      CALL CLASS(1)                                        THERMO  1000
      XTIM1=IH1*100+IM1                                    THERMO  1001
      XTIM2=IH2*100+IM2                                    THERMO  1002
      CALL LABLV(XTIM1, 20,990,4,1,4)                      THERMO  1003
      CALL PRINTV(20,LABEL1(1,2),20,932)                   THERMO  1004
      CALL LABLV(SEC1, 52,990,6,1,2)                       THERMO  1005
      CALL PRINTV(-23,23HTIME          F A G C V   ,20,962) THERMO  1006
      IF(ITRK.LE.0)GO TO 256                               THERMO  1007
      IY=914                                               THERMO  1008
      DO 2551 I=3,5                                        THERMO  1009
      CALL PRINTV(20,LABEL1(1,I),20,IY)                    THERMO  1010
      IY=IY-18                                             THERMO  1011
 2551 CONTINUE                                             THERMO  1012
  256 CONTINUE                                             THERMO  1013
      IY=860                                               THERMO  1014
      DO 258 I=1,25                                        THERMO  1015
      CALL PRINTV(20,LABEL(1,I),20,IY)                     THERMO  1016
      IY=IY-18                                             THERMO  1017
  258 CONTINUE                                             THERMO  1018
      CALL PRINTV(10,ISUMM,20,IY)                          THERMO  1019
      ISUM1=0                                              THERMO  1020
      DO 3018 I=1,100                                      THERMO  1021
      IF(I.LT.ISLEFT.OR.I.GT.ISRITE)GO TO 3018             THERMO  1022
      DO 3016 J=1,100                                      THERMO  1023
      IF(J.LT.IBOVE.OR.J.GT.IBELOW)GO TO 3016              THERMO  1024
      IF(IPIC(I,J).GT.IBKGR)ISUM1=ISUM1+IPIC(I,J)          THERMO  1025
      IF(IPIC(I,J).GE.1023)ISUMM=10HSUM GT                 THERMO  1026
 3016 CONTINUE                                             THERMO  1027
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 3010    CONTINUE
        XXSUM=ISUM1*CONVF
        IF(IPMTX.EQ.1)XXSUM=XSUM
          IF(IJSUM.EQ.0)GC TO 2588
        IF(TAP10(1).LT.T1.OR.TAP10(1).GT.T2)GO TO 2588
        IF(SR.LT.10.0)GO TO 2588
        XSUMJ=XXSUM*RESRAL*(SR*30.48)**2
          CALL LABLV(XSUMJ,100,IY-12,6,1,6)
        CALL PRINTV(-14,14H =          W/SR    ,84,IY-12)
 2588     CONTINUE
        CALL LABLV(XXSUM,100,IY,-5,1,5)
        IX=130
          DO 260 I=2,6
        XX=IBEFOR(I)
        CALL LABLV(XX,IX,950,1,1,1)
        IX=IX+16
 260      CONTINUE

           IUXSAV=IU(1,1)
          UXSAV=UAXIS
        UAXIS=VRIGHT
          IPASS=-5
        CALL PLT3D
        UAXIS=UXSAV
C****  LABEL BOTTOM OF 3-D PLOT
          IF(IVIEW.EQ.2.OR.IVIEW.EQ.4)GO TO 2611
          ITPV=ILTP
          ITPH=IWTP
          RESV=RESLFT
          RESH=RESWFT
        ISIGNV=-1
          ISIGNH=1
          IVERT=IHOVER
          IHOR=IHOHOR
          GO TO 2612
 2611     CONTINUE
          ITPV=IWTP
          ITPH=ILTP
        RESV=RESWFT
          RESH=RESLFT
          ISIGNV=1
          ISIGNH=-1
        IVERT=IHOHOR
        IHOR=IHOVER
 2612     CONTINUE
          XLIN=ITPV
        ADD=10.
        X1=IU(1,1)
        Y1=IU(2,1)
        X2=IU(1,2)
        Y2=IU(2,2)
 261      CONTINUE
          IF(XLIN.GT.100.)XLIN=100
        IF(XLIN.LT.1.)XLIN=1.
          XX=(XLIN    -ITPV)*RESV*ISIGNV
          IX =F(XLIN,UFOR,UBACK,X1,X2)
          IY =F(XLIN,UFOR,UBACK,Y1,Y2)
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         CALL POINTV(IX ,IY ,5,IDUM)                                   THERMO  1085
         CALL LABLV(XX,IX+10,IY ,4,1,2)                                THERMO  1086
         XLIN=XLIN+ADD                                                 THERMO  1087
         IF(XLIN.GT.100.)GC TO 262                                     THERMO  1088
         IF(XLIN.LT.1)GO TO 263                                        THERMO  1089
         GO TO 261                                                     THERMO  1090
  262    ADD=-10.                                                      THERMO  1091
         XLIN=ITPV                                                     THERMO  1092
         IXV=(X1+X2)/2.                                                THERMO  1093
        IYV=(Y1+Y2)/2.-60.                                             THERMO  1094
         CALL APRNTV (12,12,10,IVERT,IXV,IYV)                          THERMO  1095
         GO TO 261                                                     THERMO  1096
  263   CONTINUE                                                       THERMO  1097
         ADD=10.                                                       THERMO  1098
        XWD=ITPH                                                       THERMO  1099
          X1=IUXSAV                                                    THERMO  1100
         X2=IU(1,1)                                                    THERMO  1101
         IY =IU(2,1)                                                   THERMO  1102
  264    CONTINUE                                                      THERMO  1103
         IF(XWD.GT.100.)XWD=100                                        THERMO  1104
         IF(XWD.LT.1.)XWD=1.                                           THERMO  1105
         XX=(XWD        -ITPH)*RESH*ISIGNH                             THERMO  1106
        IX =F(XWD,VLEFT,VRIGHT,X1,X2)                                  THERMO  1107
          CALL POINTV(IX ,IY ,5,IDUM)                                  THERMO  1108
         CALL LABLV(XX,IX -8,IY -8,4,1,2)                              THERMO  1109
         XWD=XWD+ADD                                                   THERMO  1110
         IF(XWD.GT.100.)GC TO 2641                                     THERMO  1111
         IF(XWD.LT.1.)GO TO 2642                                       THERMO  1112
         GO TO 264                                                     THERMO  1113
  2641    ADD=-10.                                                     THERMO  1114
        XWD=ITPH                                                       THERMO  1115
         IXH=(X1+X2)/2.-4C.                                            THERMO  1116
         CALL PRINTV(10,IHOR,IXH,IY-20)                                THERMO  1117
         GO TO 264                                                     THERMO  1118
  2642    CONTINUE                                                     THERMO  1119
C*** LABEL VERTICAL AXIS AND DRAW HORIZONTAL LINES                      THERMO  1120
         IX2=IW(1,1)                                                   THERMO  1121
         IY=IY1                                                        THERMO  1122
         DO 265 I=1,10                                                 THERMO  1123
         CALL LINEV(IX1,IY,IX2,IY)                                     THERMO  1124
        IY=IY+IDELY                                                    THERMO  1125
  265   CCNTINUE                                                       THERMO  1126
        CALL LINEV(IX1,IY2,IX2,IY2)                                    THERMO  1127
                                                                       THERMO  1128
  300   CONTINUE                                                       THERMO  1129
        IF(.NOT.IPL2D)GO TO 400                                        THERMO  1130
C**** PLOT 2D IMAGE OF PICTURE                                          THERMO  1131
                                                                       THERMO  1132
                                                                       THERMO  1133
  400   CONTINUE                                                       THERMO  1134
C**** CHECK IF PACKED TAPE O/P                                          THERMO  1135
        IF(ITSEND.EQ.1)GO TO 401                                       THERMO  1136
         IF(ITAPE.NE.1)GO TO 200                                       THERMO  1137
  401   CONTINUE                                                       THERMO  1138
         J=1                                                           THERMO  1139
        DO 420 I=1,2000                                                THERMO  1140
        IPICT(I)=SHIFT(IPICT(J),48).OR.                                THERMO  1141
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              .     SHIFT(IPICT(J+1),36).OR.                    THERMO   1142
              .     SHIFT(IPICT(J+2),24).OR.                    THERMO   1143
              .     SHIFT(IPICT(J+3),12).OR.IPICT(J+4)          THERMO   1144
                J=J+5                                           THERMO   1145
        420   CCNTINUE                                          THERMO   1146
              IF(ITSEND.EQ.1)GO TO 425                          THERMO   1147
              WRITE(12)IBEPOR,IAPTER,INPT,(IPICT(K),K=1,2000)   THERMO   1148
                GO TO 200                                       THERMO   1149
        425   CONTINUE                                          THERMO   1150
              IPICT(10001)=T1/100.                              THERMO   1151
              IPICT(10002)=SR                                   THERMO   1152
              IPICT(10003)=RB                                   THERMO   1153
              IPICT(10004)=CONVP*10.E10                         THERMO   1154
              IPICT(10005)=IF                                   THERMO   1155
              IPICT(10006)=IA                                   THERMO   1156
              IPICT(10007)=IG                                   THERMO   1157
              IPICT(10008)=IWTP                                 THERMO   1158
              IPICT(10009)=ILTP                                 THERMO   1159
              IPICT(10010)=0                                    THERMO   1160
              L=10011                                           THERMO   1161
                DO 429 J=1,25                                   THERMO   1162
                DO 429 K=1,2                                    THERMO   1163
              IPICT(L)=LABEL(K,J)                               THERMO   1164
                L=L+1                                           THERMO   1165
        429     CONTINUE                                        THERMO   1166
              DO 430 J=10061,10100                              THERMO   1167
        430     IPICT(J)=0                                      THERMO   1168
              WRITE(12)(IPICT(J),J=10001,10100)                 THERMO   1169
              J=1                                               THERMO   1170
              DO 435 K=1,4                                      THERMO   1171
                L=J+499                                         THERMO   1172
                WRITE(12)(IPICT(LL),LL=J,L)                     THERMO   1173
        435   J=L+1                                             THERMO   1174
              GO TO 200                                         THERMO   1175
        999   CCNTINUE                                          THERMO   1176
              IF(ICLFRM.NE.0)CALL SECURE(KRD,1)                 THERMO   1177
              STOP                                              THERMO   1178
              END                                               THERMO   1179
```


CARD NR.	SEVERITY	DETAILS	DIAGNOSIS OF PROBLEM
524	I	)	THE NUMBER OF ARGUMENTS IN THE ARGUMENT LIST OF A NON-BASIC EXTERNAL FUNCTION IS INCONSISTENT.
572	I		THERE IS NO PATH TO THIS STATEMENT.
1129	I	400	THIS IF DEGENERATES INTO A SIMPLE TRANSFER TO THE LABEL INDICATED.

```
     SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS
16363  P2171

VARIABLES      SN  TYPE          RELOCATION
 23447  ABIAS      REAL                             23722  ADD      REAL
 23441  ATP        REAL                             23445  ATRK     REAL
 23636  AZAG       REAL                             23605  AZMAX    REAL
 23735  CONV       REAL       ARRAY                     5  CONVF    REAL                IPMTX
 23444  DA         REAL                             23434  DABOVE   REAL
 23435  DBELOW     REAL                             23677  DELX     REAL
 23550  DIFF       REAL                             23432  DLEFT    REAL
 23433  DRIGHT     REAL                             23450  EBIAS    REAL
 23637  ELAG       REAL                             23606  ELMAX    REAL
 23442  ETP        REAL                             23446  ETRK     REAL
 23411  I          INTEGER                          23543  IA       INTEGER
 23567  IADD       INTEGER                              7  IAFTER   INTEGER  ARRAY   / /
     1  IBACK      INTEGER          PLIP                6  IBEFOR   INTEGER  ARRAY   / /
 23433  IBELOW     INTEGER                          23455  IBK      INTEGER
     4  IBKGR      INTEGER          IPMTX           23427  IBOVE    INTEGER
 23552  IC         INTEGER                             12  ICAL     INTEGER         PDPFT
 23561  ICARIG     INTEGER                          23645  ICELLX   INTEGER
 23660  ICELLY     INTEGER                          23654  ICELY    INTEGER
    10  ICKSTF     INTEGER          PDPFT               7  ICKSTR   INTEGER         PDPFT
     0  ICLASS     INTEGER          CLASF           23465  ICLFRM   INTEGER
 23630  ICNT       INTEGER                          23527  ICNT3D   INTEGER
 23437  IDEL       INTEGER                          23674  IDELY    INTEGER
 23661  IDUM       INTEGER                          23664  IE       INTEGER
 23460  IEDCNT     INTEGER                          23464  IEDOWN   INTEGER
 23462  IEDT       INTEGER                          23463  IEDUP    INTEGER
 23666  IEE        INTEGER                              3  IEND     INTEGER         PDPFT
 23542  IF         INTEGER                          23436  IFEET    INTEGER
 24477  IFILT      INTEGER    ARRAY                 23424  IFIND    INTEGER
     0  IFOR       INTEGER          PLIP            23651  IFRMTX   INTEGER
 23453  IFSEND     INTEGER                          23544  IG       INTEGER
 23547  IHOMOR     INTEGER                          23720  IHOR     INTEGER
 23546  IHOVER     INTEGER                          23614  IHVCO    INTEGER
 23553  IH1        INTEGER                          23556  IH2      INTEGER
 23431  IJSUM      INTEGER                          23533  ILAB     INTEGER
 23416  ILCENT     INTEGER                              2  ILEFT    INTEGER         PLIM
 23526  ILINE      INTEGER                          23620  ILMXTP   INTEGER
 23657  ILNEXT     INTEGER                              3  ILTP     INTEGER         IPMTX
 23624  ILTPM2     INTEGER                          23625  ILTPP2   INTEGER
   115  ILTRK      INTEGER          IPMTX           23601  ILX      INTEGER
 23474  IMTX       INTEGER                          23615  IMVCO    INTEGER
 23451  IMXCT      INTEGER                          23467  IMXL     INTEGER
 23470  IMXW       INTEGER                          23554  IM1      INTEGER
 23557  IM2        INTEGER                          23564  INOX     INTEGER
    13  INPT       INTEGER          PDPFT           24403  IOPT     INTEGER  ARRAY
     5  IPASS      INTEGER          PLIP            23562  IPC      INTEGER
 23503  IPCNT      INTEGER                             17  IPIC     INTEGER  ARRAY   / /
    17  IPICT      INTEGER    ARRAY  / /            23501  IPLOT    INTEGER
 23410  IPL2D      LOGICAL                          23407  IPL3D    LOGICAL
 23643  IPMTX      INTEGER                          23610  IPPR1    INTEGER
 23607  IPPR2      INTEGER                          23623  IPR      INTEGER
 23476  IPRINT     INTEGER                          23514  IPRL1    INTEGER
```

PROGRAM P2171 74/74 OPT=1 TRACE FTN 4.2+74355 09/29/76 12.58.08. PAGE 24

VARIABLES SN TYPE RELOCATION

SN	VARIABLE	TYPE		RELOCATION	SN	VARIABLE	TYPE		RELOCATION
23515	IPRL2	INTEGER			121	IPRMTX	INTEGER		IPMTX
23516	IPRW1	INTEGER			23517	IPRW2	INTEGER		
23520	IPVL	INTEGER			23521	IPVL2	INTEGER		
23522	IPVW	INTEGER			23523	IPVW2	INTEGER		
23662	IPX	INTEGER			23510	IP2DL1	INTEGER		
23511	IP2DL2	INTEGER			23512	IP2DW1	INTEGER		
23513	IP2DW2	INTEGER			23504	IP3DL1	INTEGER		
23505	IP3DL2	INTEGER			23506	IP3DW1	INTEGER		
23507	IP3DW2	INTEGER			3	IRIGHT	INTEGER		PLIM
23716	ISIGNH	INTEGER			23715	ISIGNV	INTEGER		
23425	ISLEFT	INTEGER			23426	ISRITE	INTEGER		
23566	ISUM	INTEGER			122	ISUMM	INTEGER		IPMTX
23604	ISUM1	INTEGER			23641	ISUM2	INTEGER		
23530	ITAP	INTEGER			23502	ITAPE	INTEGER		
16	ITOP	INTEGER		/ /	23712	ITPH	INTEGER		
120	ITPT	INTEGER		IPMTX	23711	ITPV	INTEGER		
23613	ITR	INTEGER			23413	ITRK	INTEGER		
23452	ITSEND	INTEGER			23415	IT10	INTEGER		
12	IU	INTEGER	ARRAY	MAXVAL	23707	IUXSAV	INTEGER		
16	IV	INTEGER	ARRAY	MAXVAL	11	IVALID	INTEGER		PDPFT
23717	IVERT	INTEGER			4	IVIEW	INTEGER		PLIM
22	IW	INTEGER	ARRAY	MAXVAL	23417	IWCENT	INTEGER		
23621	IWMXTP	INTEGER			2	IWTP	INTEGER		IPMTX
114	IWTRK	INTEGER		IPMTX	23655	IX	INTEGER		
23626	IXCEL	INTEGER			23627	IXCEL2	INTEGER		
23730	IXH	INTEGER			23646	IXLEFT	INTEGER		
23725	IXV	INTEGER			23663	IXX	INTEGER		
23671	IX1	INTEGER			23731	IX2	INTEGER		
23653	IY	INTEGER			23650	IYBOT	INTEGER		
23647	IYTOP	INTEGER			23726	IYV	INTEGER		
23702	IYY	INTEGER			23672	IY1	INTEGER		
23673	IY2	INTEGER			23573	I1	INTEGER		
23574	I2	INTEGER			23563	J	INTEGER		
7	JEND	INTEGER		IPMTX	23612	JJ	INTEGER		
23631	JJJ	INTEGER			4	JSTOP	INTEGER		PDPFT
23576	J1	INTEGER			23577	J2	INTEGER		
23732	K	INTEGER			23934	KARD	INTEGER		
23611	KK	INTEGER			24373	KRD	INTEGER	ARRAY	
23733	L	INTEGER			13	LABEL	INTEGER	ARRAY	IPMTX
75	LABEL1	INTEGER	ARRAY	IPMTX	23701	LABVER	INTEGER		
23617	LEVEL	INTEGER			23414	LIN9	INTEGER		
23734	LL	INTEGER			23602	LV1	INTEGER		
23603	LV2	INTEGER			23575	MAXADJ	INTEGER		
6	MAXCNT	INTEGER		IPMTX	23461	MINEDT	INTEGER		
23456	MINVAL	INTEGER			23632	MMM	INTEGER		
23457	MNVAL	INTEGER			23633	MOVHOR	INTEGER		
23634	MOVVER	INTEGER			23570	MXCNT1	INTEGER		
23571	MXCNT2	INTEGER			23466	MXL1	INTEGER		
23472	MXL2	INTEGER			23471	MXW1	INTEGER		
23473	MXW2	INTEGER			23656	N	INTEGER		
23642	NABOVE	INTEGER			23700	NC	INTEGER		
23532	NEWPAS	INTEGER			10	NFR	INTEGER		IPMTX
23475	NFRM	INTEGER			23440	NFRMTX	INTEGER		
23665	NL	INTEGER			23703	NLAST	INTEGER		
0	NLEFT	INTEGER		IPMTX	23412	NPICT	INTEGER		
23525	NPL2D	INTEGER			23524	NPL3D	INTEGER		
23541	NPRINT	INTEGER			1	NRIGHT	INTEGER		IPMTX

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PROGRAM P2171        74/74     OPT=1     TRACE                          FTN 4.2+74355         09/29/76  12.58.08.         PAGE    25

VARIABLES       SN  TYPE              RELOCATION
     1  NSR         INTEGER            POPFT         23572  NSUM      INTEGER
 23565  NUMVAL      INTEGER                          23600  NVALUE    INTEGER
     0  NWS         INTEGER            POPFT             2  ONE       REAL                    POPFT
 23500  PCT         REAL                             23640  RADAG     REAL
 23422  RADLIN      REAL                             23622  RADTP     REAL
 23635  RADTRK      REAL                             23423  RADWD     REAL
 23443  RB          REAL                             23545  RBCELL    REAL
 23644  RBDIFF      REAL                             23531  RBSAV     REAL
 23714  RESM        REAL                                11  RESLFT    REAL                    IPMTX
 23420  RESLIN      REAL                               112  RESRAD    REAL                    IPMTX
 23713  RESV        REAL                             23421  RESWD     REAL
    12  RESWFT      REAL               IPMTX         23616  SECVCO    REAL
 23559  SEC1        REAL                             23560  SEC2      REAL
   113  SR          REAL               IPMTX             5  START     REAL                    POPFT
     6  STOP        REAL               POPFT         24335  TAP10     REAL         ARRAY
 24415  TDELE       REAL        ARRAY                    6  THETA     REAL                    MAXVAL
     1  TITLE       REAL        ARRAY  CLASF         23454  TTDIF     REAL
 23551  TTDIFF      REAL                                 0  T1        REAL                    / /
 23477  T1SAVE      REAL                                 7  T2        REAL                    / /
     7  UAXIS       REAL               MAXVAL            1  UBACK     REAL                    MAXVAL
     0  UFOR        REAL               MAXVAL           11  UVPLNE    REAL                    MAXVAL
 23710  UXSAV       REAL                                10  VAXIS     REAL                    MAXVAL
     2  VLEFT       REAL               MAXVAL            3  VRIGHT    REAL                    MAXVAL
 23676  WB          REAL                                 4  WBOT      REAL                    MAXVAL
 23675  WT          REAL                                 5  WTOP      REAL                    MAXVAL
 23667  XE          REAL                             23721  XLIN      REAL
 23437  XPICT       REAL        ARRAY  / /             111  XSUM      REAL                    IPMTX
 23670  XSUMJ       REAL                             23704  XTIM1     REAL
 23705  XTIM2       REAL                               116  XTRK      REAL                    IPMTX
 23727  XWD         REAL                             23652  XX        REAL
 23706  XXSUM       REAL                             23535  X1        REAL
 23536  X2          REAL                             23537  X3        REAL
 23540  X4          REAL                               117  YTRK      REAL                    IPMTX
 23723  Y1          REAL                             23724  Y2        REAL

FILE NAMES         MODE
     0  INPUT                   2041  OUTPUT    FMT          10204  TAPE10    UNFMT        4102  TAPE11
 12245  TAPE12      UNFMT      14306  TAPE14                     0  TAPE4     FMT             0  TAPE5
  2041  TAPE6                   6143  TAPE9

EXTERNALS          TYPE     ARGS
        ABS        REAL      1                        ALOG10    REAL       1
        APRNTV               6                        ATAN      REAL       1
        BIGV                 0                        CLASS                1
        EOF        REAL      1                        FRAMEV               1
        GETPIC               0                        IABS      INTEGER    1
        IHMS                 4                        IOCHEC    INTEGER    1
        LABLV                6                        LINEV                4
        MAX0       INTEGER   2                        MIN0      INTEGER    2
        MOD        INTEGER   2                        PACKED               0
        PLT30                0                        POINTV               4
        PRINTV               4                        PRTMTX               0
        REPRNT               0                        RITE2V               9
        SECURE               2                        SHIFT     NO TYPE    2
        SIGN       REAL      2                        SIN       REAL       1
        SMALLV               0
```

```
      PROGRAM P2171      74/74    OPT=1    TRACE                    FTN 4.2+74355       09/29/76  12.58.08.        PAGE     26

  INLINE FUNCTIONS    TYPE    ARGS
         F            REAL      5     SF

  STATEMENT LABELS
      0  2                             0  10      INACTIVE                16532  11
  16546  12                        16576  13                              16564  14
  16556  15                        16561  16                              16637  100
      0  101         INACTIVE      16644  110                                 0  112       INACTIVE
  16746  120                       16775  130                             17007  140
  17052  141                       17102  150                             17104  160
  17111  170                       17113  180                             17115  190
  17132  192                       17140  194                             17201  196
  17222  198                       17231  200                             17237  201
  17243  202                       17244  203                             17264  204
  17362  205                       17624  206                             17656  207
      0  210                       17770  215                             20019  229
  20015  230                       20020  240                             21210  250
  21263  251                           0  255                             21342  256
      0  258                           0  260                             21525  261
  21573  262                       21610  263                             21620  264
      0  265                       21707  300                             21710  400
  21714  401                           0  420                             21791  425
      0  429                           0  430                                 0  435
  22027  999                       22677  1000     FMT                    22723  1001      FMT
  22650  1002      FMT             22662  1003     FMT                    16705  1101
  16713  1102                      16721  1103                            16727  1104
  16734  1105                      17150  1940                            17203  1988
  22750  1998      FMT             23015  1999     FMT                    23050  2000      FMT
  23102  2001      FMT             23077  2002     FMT                    23070  2003      FMT
  22706  2004      FMT             22735  2005     FMT                    23114  2006      FMT
  17266  2044                      17307  2045                            17326  2046
  17516  2047                      17531  2048                            17540  2050
  17546  2053                      17546  2054                            17570  2055
  17577  2056                      17615  2057                                0  2059
  17404  2060                      17423  2065                                0  2066
      0  2551                      21437  2588                            21502  2611
  21514  2612                      21657  2641                            21673  2642
  20401  3000                      20026  3001                                0  3002
  20172  3003                      20161  3004                            20072  3005
  20106  3006                      20322  3007                            20361  3008
  20414  3009                      23137  3010     FMT  NO REFS           23165  3011      FMT  NO REFS
  20477  3012                      20212  3013                            20054  3014
  20131  3015                      21402  3016                            20135  3017
  21404  3018                          0  3020                                0  3030
  20272  3039                      20273  3040                                0  3041
  20303  3042                      21153  3045                            21154  3046
      0  3050                          0  3060        INACTIVE            20574  3061
  20726  3063                      20761  3064                                0  3065
  20775  3066                      21004  3067                            21034  3068
  21014  3077                      21046  3080                            21071  3089
  21076  3090                          0  3569        INACTIVE                0  3669      INACTIVE
  21101  4000                      21143  4008                                0  4010
  21147  4011                      21156  4015                            21210  4016
  21207  4115                      23135  9876     FMT  NO REFS

  COMMON BLOCKS   LENGTH
         / /       10115
         IPMTX        83
```

```
      PROGRAM P2171          74/74    OPT=1    TRACE                       FTN 4.2+74355       09/29/76  12.58.08.         PAGE    27

COMMON BLOCKS    LENGTH
       POPFT          12
       MAXVAL         22
       PLIM            6
       CLASF           9

STATISTICS
  PROGRAM LENGTH                 6173B      3199
  BUFFER LENGTH                163478B      7399
  CM LABELED COMMON LENGTH        204B       132
  CM BLANK COMMON LENGTH       236038B     10115


    SUBROUTINE IHMS          74/74    OPT=1    TRACE                       FTN 4.2+74355       09/29/76  12.58.27.         PAGE     1

                    SUBROUTINE IHMS(TMS,IH,IM,SEC)                                              MAY75       2
                    IH=TMS/3.6E6                                                                MAY75       3
                    IM=(TMS-IH*3.6E6)/60000.                                                    MAY75       4
                    SEC=(TMS-IH*3.6E6-IM*60000)/1000.                                           MAY75       5
      5             RETURN                                                                      MAY75       6
                    END                                                                         MAY75       7


    SUBROUTINE IHMS          74/74    OPT=1    TRACE                       FTN 4.2+74355       09/29/76  12.58.27.         PAGE     2

    SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS
    3  IHMS

VARIABLES       SN  TYPE            RELOCATION
    0  IH           INTEGER             F.P.          0  IM       INTEGER          F.P.
    0  SEC          REAL                F.P.          0  TMS      REAL             F.P.

STATISTICS
  PROGRAM LENGTH                   24B        20
```

```
      SUBROUTINE REPRNT      74/74    OPT=1    TRACE                    FTN 4.2+74355        09/29/76  12.58.30.        PAGE     1

                        SUBROUTINE REPRNT                                                        MAY75      8
                        DIMENSION X(8)                                                           MAY75      9
                        I=0                                                                      MAY75     10
                        WRITE(6,600)                                                             MAY75     11
                      1 READ(4,500) X                                                            MAY75     12
                        I=I+1                                                                    MAY75     13
                    500 FORMAT(8A10)                                                             MAY75     14
                        IF(EOF(4).NE. 0.0) GO TO 2                                               MAY75     15
                        WRITE(6,601) X                                                           MAY75     16
                        GO TO 1                                                                  MAY75     17
                      2 IM1=I-1                                                                  MAY75     18
                        DO 10 J=1,IM1                                                            MAY75     19
                        BACKSPACE 4                                                              MAY75     20
                     10 CONTINUE                                                                 MAY75     21
                        WRITE(6,602)                                                             MAY75     22
                    600 FORMAT(1H1,*   BEGINNING OF INPUT DATA *//)                                MAY75     23
                    601 FORMAT(1X,8A10)                                                          MAY75     24
                    602 FORMAT(*     END OF INPUT DATA   *//)                                    MAY75     25
                        END                                                                      MAY75     26


      SUBROUTINE REPRNT      74/74    OPT=1    TRACE                    FTN 4.2+74355        09/29/76  12.58.30.        PAGE     2

      SYMBOLIC REFERENCE MAP (R=1)

  ENTRY POINTS
     1   REPRNT

  VARIABLES       SN  TYPE             RELOCATION
     67   I           INTEGER                             70  IM1        INTEGER
     71   J           INTEGER                             72  X          REAL         ARRAY

  FILE NAMES           MODE
        TAPE4         FMT                     TAPE6      FMT

  EXTERNALS                TYPE    ARGS
        EOF           REAL        1

  STATEMENT LABELS
     5   1                                     15   2                                        0  10
    41   500      FMT                          53  600       FMT                            60  601       FMT
    62   602      FMT

  STATISTICS
    PROGRAM LENGTH              102B      66
```

```
SUBROUTINE ROMODE      74/74    OPT=1    TRACE                    FTN 4.2+74355      09/29/76  12.58.31.       PAGE     1

                    SUBROUTINE ROMODE(IT,IN,NCHAR,ICODE,ICS)                   MAY75      27
                    DIMENSION IN(256)                                          MAY75      28
                  1 BUFFER IN(IT,1) (IN(1),IN(256))                            MAY75      29
                    IF(UNIT(IT))3,10,5                                         MAY75      30
              C     ICODE=0 INDICATES A GOOD RECORD                            MAY75      31
              C     ICODE=1 INDICATES PARITY ERROR                             MAY75      32
              C     ICODE=4 INDICATESA PARITY ERROR WITH A LONG RECORD         MAY75      33
              C     ICODE=2 INDICATESASHORT RECORD                             MAY75      34
              C     ICODE=888 INDICATES A ZERO LENGTH RECORD                   MAY75      35
              C     ICODE=999 INDICATES AN EOF WAS ENCOUNTERED ON IT           MAY75      36
                  3 ICODE=0                                                    MAY75      37
                    ICS=LENGTH(IT)                                             MAY75      38
                    ICS=ICS*10                                                 SEPT12      1
                    IF(ICS.EQ.0) ICODE=888                                     MAY75      39
                    IF(ICS.GT.NCHAR) ICODE=4                                   MAY75      40
                    IF(ICS.LT.NCHAR) ICODE=2                                   MAY75      41
                    RETURN                                                     MAY75      42
                  5 ICODE=1                                                    MAY75      43
                    ICS=LENGTH(IT)                                             MAY75      44
                    ICS=ICS*10                                                 SEPT12      2
                    IF(ICS.GT.NCHAR) ICODE=5                                   MAY75      45
                    IF(ICS.EQ.0) ICODE=888                                     MAY75      46
                    RETURN                                                     MAY75      47
                 10 ICODE=999                                                  MAY75      48
                    ICS=LENGTH(IT)                                             MAY75      49
                    ICS=ICS*10                                                 SEPT12      3
                    RETURN                                                     MAY75      50
                    END                                                        MAY75      51

SUBROUTINE ROMODE      74/74    OPT=1    TRACE                    FTN 4.2+74355      09/29/76  12.58.31.       PAGE     2

      SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS
    3  ROMODE

VARIABLES     SN  TYPE            RELOCATION
    0  ICODE      INTEGER              F.P.            0  ICS        INTEGER          F.P.
    0  IN         INTEGER    ARRAY     F.P.            0  IT         INTEGER          F.P.
    0  NCHAR      INTEGER              F.P.

EXTERNALS          TYPE    ARGS
       LENGTH     INTEGER    1                            UNIT       REAL        1

STATEMENT LABELS
    0  1              INACTIVE             0  3           INACTIVE            36  5
   53  10

STATISTICS
  PROGRAM LENGTH                 70B     56
```

SUBROUTINE PRTMTX   74/74   OPT=1   TRACE   FTN 4.2+74355   09/29/76   12.58.34.   PAGE   1

```
                SUBROUTINE PRTMTX                                                THERMO    1180
                  COMMON/IPMTX/NLEFT,NRIGHT,IHTP,ILTP,IBKGR,CONVF,MAXCNT,JEND,NFR,  THERMO    1181
             .      RESLFT,RESWFT,LABEL(2,25),LABEL1(2,6),XSUM,RESRAD,SR         THERMO    1182
             ..IHTRK,ILTRK,XTRK,YTRK,ITPT                                        THERMO    1183
             .. IPRMTX,ISUMM                                                     THERMO    1184
                DIMENSION IBLANK(26)                                             THERMO    1185
                COMMON IBEFOR( 7),IAFTER( 7),ITOP,IPIC(100,101)                  THERMO    1186
                  COMMON/CLASF/ICLASS,TITLE(8)                                   THERMO    1187
                  DIMENSION IOUT(27),XOUT(27)                                    THERMO    1188
                EQUIVALENCE (T1,IBEFOR(1))                                       THERMO    1189
                EQUIVALENCE(IOUT(1),XOUT(1))                                     THERMO    1190
                DATA IBLANK/26*10H          /                                    THERMO    1191
                DATA NUSED,LTOTAL/69,1020/                                       THERMO    1192
                ISUMM=10HSUM =                                                   THERMO    1193
                IF(IPRMTX.NE.2)GO TO 95                                          THERMO    1194
                NLINES = (MINO(JEND,NRIGHT)-NLEFT)*2   + 24                      THERMO    1195
                 IF((LTOTAL-NUSED).GE.NLINES)GO TO 90                            THERMO    1196
                NSKIP=(LTOTAL-NUSED-1)/68+1                                      THERMO    1197
                DO 85 I=1,NSKIP                                                  THERMO    1198
       85       WRITE(9,1000)                                                    THERMO    1199
                NUSED=0                                                          THERMO    1200
       90        NUSED=NUSED+NLINES                                              THERMO    1201
                WRITE(9,1010)TITLE                                               THERMO    1202
       1010      FORMAT(////////1X,28X,8A10)                                     THERMO    1203
                 GO TO 96                                                        THERMO    1204
       95       CONTINUE                                                         THERMO    1205
                WRITE(9,1000)TITLE                                               THERMO    1206
       96       CONTINUE                                                         THERMO    1207
       1000      FORMAT(1H1,28X,8A10)                                            THERMO    1208
                  WRITE(9,1005)((LABEL1(I,J),I=1,2),J=1,5)                       THERMO    1209
                  WRITE(9,1005)((LABEL (I,J),I=1,2),J=1,25 )                     THERMO    1210
       1005     FORMAT(5(1X,A10,    A10))                                        THERMO    1211
                  IPR=55555                                                      THERMO    1212
       C***     PRINT 9876,ILTF,IHTP,NLEFT,JEND,IBKGR,IPR                        THERMO    1213
       9876      FORMAT(1X,10I7)                                                 THERMO    1214
                XMAX=MAXCNT*CONVF                                                THERMO    1215
                 IE=ALOG10(XMAX)                                                 THERMO    1216
                IEE=IABS(IE)                                                     THERMO    1217
                 XMULT=CONVF*(10**(IEE+4))                                       THERMO    1218
                IF(CONVF.EQ.1.0)XMULT=1.0                                        THERMO    1219
                 ISUM2=0                                                         THERMO    1220
                DO 30 I=2,27                                                     THERMO    1221
                XOUT(I)=(I-13)*RESLFT                                            THERMO    1222
                IF(MOD(I,2).EQ.0)XOUT(I)=4H                                      THERMO    1223
       30        CONTINUE                                                        THERMO    1224
                WRITE(9,1001)(XOUT(I),I=2,27)                                    THERMO    1225
       1001      FORMAT(1H0,5X,13(A5,F5.2)/6X,26(5H     ))                       THERMO    1226
                IXCELL=NLEFT                                                     THERMO    1227
       40        CONTINUE                                                        THERMO    1228
                IF(IXCELL.LT.1)GO TO 65                                          THERMO    1229
                DO 60 I=2,27                                                     THERMO    1230
                IYCELL=ILTP+13-I                                                 THERMO    1231
                 IBLANK(I-1)=4H                                                  THERMO    1232
                IF(IPRMTX.EQ.3)IBLANK(I-1)=1H.                                   THERMO    1233
                IF(ITPT.EQ.0)GO TO 63                                            THERMO    1234
                 IF(ITPT.EQ.1.AND.XTRK.LT.-99.99)GO TO 63                        THERMO    1235
                IF(IPRMTX.NE.3)GO TO 62                                          THERMO    1236
```

SUBROUTINE PRTMTX   74/74   OPT=1   TRACE   FTN 4.2+74355   09/29/76   12.58.34.   PAGE   2

```
             IF(IXCELL.NE.INTRK)GO TO 63                                            THERMO   1237
             IF(IYCELL.EQ.ILTRK)IBLANK(I-1)=1H(                                     THERMO   1238
             IF(IYCELL.EQ.ILTRK+1)IBLANK(I-1)=1H)                                   THERMO   1239
             GO TO 63                                                               THERMO   1240
      62     CONTINUE                                                               THERMO   1241
             IF(IYCELL.NE.ILTRK)GO TO 63                                            THERMO   1242
             IF(IXCELL.NE.INTRK.AND.(IXCELL+1).NE.INTRK)GO TO 63                    THERMO   1243
              IBLANK(I-1)=4H****                                                    THERMO   1244
      63     CONTINUE                                                               THERMO   1245
             IF(IYCELL.LT.1.OR.IYCELL.GT.100)GO TO 45                               THERMO   1246
             IPX=IPIC(IXCELL,IYCELL)                                                THERMO   1247
             IF(IPX.LE.IBKGR)GO TO 45                                               THERMO   1248
               ISUM2=ISUM2+IPX                                                      THERMO   1249
             IVAL=IPX*XMULT                                                         THERMO   1250
             ENCODE(4,1003,IOUT(I))IVAL                                             THERMO   1251
      1003    FORMAT(I4)                                                            THERMO   1252
              IF(IPX.LT.1023)GO TO 60                                               THERMO   1253
           - IOUT(I)=10HXXXX                                                        THERMO   1254
             ISUMM=10HSUM GT                                                        THERMO   1255
             GO TO 60                                                               THERMO   1256
      45     CONTINUE                                                               THERMO   1257
             IOUT(I)=4H                                                             THERMO   1258
      60     CONTINUE                                                               THERMO   1259
             XOUT(1)=(IXCELL-INTP)*RESWFT                                           THERMO   1260
             IF(IPRMTX.NE.3)GO TO 64                                                THERMO   1261
              WRITE(9,1008)IOUT(1),((IBLANK(J),IOUT(J+1)),J=1,26)                   THERMO   1262
             GO TO 65                                                               THERMO   1263
      1008    FORMAT(1X,F5.2,26(A1,A4))                                             THERMO   1264
      64     CONTINUE                                                               THERMO   1265
              WRITE(9,1004)IOUT,IBLANK                                              THERMO   1266
      1004    FORMAT(1X,F5.2,26(1H,,A4)/6X,26(1H,,A4))                              THERMO   1267
      65      IXCELL=IXCELL+1                                                       THERMO   1268
             IF(IXCELL.GT.100.OR.IXCELL.GT.JEND.OR.IXCELL.GT.NRIGHT)GO TO 900       THERMO   1269
             GO TO 40                                                               THERMO   1270
      900  , CONTINUE                                                               THERMO   1271
             IF(CONVF.NE.1.0)GO TO 910                                              THERMO   1272
             WRITE(9,1009)IBKGR,ISUMM,ISUM2                                         THERMO   1273
      1009    FORMAT(1H0,*NOTE- ALL MATRIX VALUES ARE IN COUNTS*/,                  THERMO   1274
           .7X,*BLANK CELLS ARE LESS THAN*,I5,* COUNTS*/,                           THERMO   1275
           . 7X,A6,I8   )                                                           THERMO   1276
             GO TO 999                                                              THERMO   1277
      910     CONTINUE                                                              THERMO   1278
              XPOWR=1./(10.**(IEE+4))                                               THERMO   1279
              BKGR=IBKGR*CONVF                                                      THERMO   1280
             XSUM=ISUM2*CONVF                                                       THERMO   1281
             WRITE(9,1006)XPOWF,BKGR,ISUMM,XSUM                                     THERMO   1282
      1006    FORMAT(1H0,*NOTE- ALL MATRIX VALUES ARE TO BE MULTIPLIED BY*,         THERMO   1283
           . F10.9,16H WATT/(CMSQ*STR)    /                                         THERMO   1284
           . 7X,*BLANK CELLS ARE LESS THAN*,F10.9,16H WATT/(CMSQ*STR)     /         THERMO   1285
           . 7X,A6,F15.10,16H WATT/(CMSQ*STR)            )                          THERMO   1286
             IF(SR.LE.10.0)GO TO 999                                                THERMO   1287
              WSTR=XSUM*RESRAD*(SR*30.48)**2                                        THERMO   1288
              WRITE(9,1007)WSTR                                                     THERMO   1289
      1007    FORMAT(11X*=*,F10.3,*WATT/STR*)                                       THERMO   1290
      999    CONTINUE                                                               THERMO   1291
              IPR=66666                                                             THERMO   1292
      C***   PRINT 9876,ILTF,INTP,NLEFT,JEND,IBKGR,IPR                              THERMO   1293
```

```
      SUBROUTINE PRTMTX      74/74    OPT=1    TRACE                        FTN 4.2+74355        09/29/76  12.58.34.        PAGE      3

 115                   RETURN                                                                      THERMO    1294
                       END                                                                         THERMO    1295
```

```
      SUBROUTINE PRTMTX      74/74    OPT=1    TRACE                        FTN 4.2+74355        09/29/76  12.58.34.        PAGE      4

CARD NR. SEVERITY  DETAILS   DIAGNOSIS OF PROBLEM

    104      I      12CO 105  FIELD WIDTH OF A CONVERSION DESCRIPTOR SHOULD BE AS LARGE AS THE MINIMUM SPECIFIED FOR THAT DESCRIPTOR.
    104      I      43CO 106  FIELD WIDTH OF A CONVERSION DESCRIPTOR SHOULD BE AS LARGE AS THE MINIMUM SPECIFIED FOR THAT DESCRIPTOR.
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      SUBROUTINE PRTMTX     74/74    OPT=1   TRACE                   FTN 4.2+74355       09/29/76  12.58.34.       PAGE      5

      SYMBOLIC REFERENCE MAP (R=1)

 ENTRY POINTS
     1  PRTMTX

 VARIABLES      SN  TYPE              RELOCATION
   532  BKGR        REAL                                  5  CONVF     REAL                  IPMTX
   515  I           INTEGER                               7  IAFTER    INTEGER     ARRAY     / /
     0  IBEFOR      INTEGER     ARRAY    / /              4  IBKGR     INTEGER               IPMTX
   567  IBLANK      INTEGER     ARRAY                     0  ICLASS    INTEGER               CLASF
   521  IE          INTEGER                             522  IEE       INTEGER
     3  ILTP        INTEGER              IPMTX          115  ILTRK     INTEGER               IPMTX
   534  IOUT        INTEGER     ARRAY                    17  IPIC      INTEGER     ARRAY     / /
   517  IPR         INTEGER                             121  IPRMTX    INTEGER               IPMTX
   527  IPX         INTEGER                             122  ISUMM     INTEGER               IPMTX
   524  ISUM2       INTEGER                              16  ITOP      INTEGER               / /
   120  ITPT        INTEGER              IPMTX          530  IVAL      INTEGER
     2  IWTP        INTEGER              IPMTX          114  IWTRK     INTEGER               IPMTX
   525  IXCELL      INTEGER                             526  IYCELL    INTEGER
   516  J           INTEGER                               7  JEND      INTEGER               IPMTX
    13  LABEL       INTEGER     ARRAY    IPMTX           75  LABEL1    INTEGER     ARRAY     IPMTX
   307  LTOTAL      INTEGER                               6  MAXCNT    INTEGER               IPMTX
    10  NFR         INTEGER              IPMTX            0  NLEFT     INTEGER               IPMTX
   513  NLINES      INTEGER                               1  NRIGHT    INTEGER               IPMTX
   514  NSKIP       INTEGER                             306  NUSED     INTEGER
    11  RESLFT      REAL                 IPMTX          112  RESRAD    REAL                  IPMTX
    12  RESWFT      REAL                 IPMTX          113  SR        REAL                  IPMTX
     1  TITLE       REAL        ARRAY    CLASF            0  T1        REAL                  / /
   533  WSTR        REAL                                520  XMAX      REAL
   523  XMULT       REAL                                534  XOUT      REAL        ARRAY
   531  XPOWR       REAL                                111  XSUM      REAL                  IPMTX
   116  XTRK        REAL                 IPMTX          117  YTRK      REAL                  IPMTX

 FILE NAMES          MODE
        TAPE9        FMT

 EXTERNALS             TYPE    ARGS
        ALOG10      REAL        1                            IABS      INTEGER     1
        MINO        INTEGER     2                            MOD       INTEGER     2

 STATEMENT LABELS
     0  30                              102  40                                      175  45
   177  60                              140  62                                      151  63
   223  64                              225  65                                        0  85
    26  90                               32  95                                       34  96
   233  900                             240  910                                     262  999
   326  1000    FMT                     352  1001    FMT                             364  1003    FMT
   406  1004    FMT                     341  1005    FMT                             442  1006    FMT
   470  1007    FMT                     376  1008    FMT                             420  1009    FMT
   317  1010    FMT                     344  9876    FMT  NO REFS

 COMMON BLOCKS    LENGTH
        IPMTX         83
        / /        10115
        CLASF          9
```

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STATISTICS
  PROGRAM LENGTH                 621B      401
  CM LABELED COMMON LENGTH       134B       92
  CM BLANK COMMON LENGTH      23603B     10119
```

```
                SUBROUTINE SECURE(K,IFLAG)                                        THERMO    1296
                DIMENSION K(8),IAUTHR(6), IRITE(8,9),IA(34)                       THERMO    1297
                EXTERNAL TABL1V                                                   THERMO    1298
                DATA IRITE,   IA/72*(10H           ),10HCLASSIFIED,104 BY        . THERMO    1299
               110HEXEMPT   F,10HROM GENERA,10HL DECLASIF,10HICATION SC,          THERMO    1300
               210HHEDULE    ,10HEXCLUDED F,10HSUBJECT  T,10HO   GENERA,          THERMO    1301
               310HOF EXECUTI,10HVE ORDER  ,10H 11652    ,10HEXEMPTION ,          THERMO    1302
               410HCATEGORY  ,10HAUTOMATICA,10HLLY DOWNGR,10HADE AT TWO,          THERMO    1303
               510H YEAR INTE,10HVALS     ,10HDECLASSIFY,10H ON       ,           THERMO    1304
               610H UPON NOTI,10HFICATION B,10HY THE ORIG,10HINATOR     ,          THERMO    1305
               710H NOT AUTOM,10HATICALLY D,10HECLASSIFIE,10HD         ,          THERMO    1306
               810H          ,10H          ,10H          ,10H          /          THERMO    1307
                IF(IFLAG.EQ.1) GO TO 300                                          THERMO    1308
                DECODE(12,1000,K(2))IC,IR,ID,IE,IW,IN                             THERMO    1309
          1000  FORMAT(6I2)                                                       THERMO    1310
                IF(IR.LT.1.OR.IR.GT.19) RETURN                                    THERMO    1311
                READ(4,900) IJOB,IPROJ,IMSN,IDATE,IRUN,IDAY                       THERMO    1312
           900  FORMAT(A4,6X,5A10)                                                THERMO    1313
                CALL FRAMEV(3)                                                    THERMO    1314
                IF(IC.LT.1) GO TO 10                                              THERMO    1315
                IF(IR.GT.9) GO TO 19                                              THERMO    1316
                READ(4,901) IAUTHR,IDCLAS,M                                       THERMO    1317
           901  FORMAT(5A10,A9,10X,A10,A1)                                        THERMO    1318
            19  CONTINUE                                                          THERMO    1319
                CALL CLASSG(IC)                                                   THERMO    1320
                ENCODE(10,1002,ICAT) ID                                           THERMO    1321
          1002  FORMAT(I10)                                                       THERMO    1322
            10  CALL CHSIZV(5,5)                                                  THERMO    1323
                CALL RITSTV(25,35,TABL1V)                                         THERMO    1324
                CALL RITE2V(430,800,1023,90,2,5,-1,5HSTART,N)                     THERMO    1325
                CALL RITE2V(430,600,1023,90,2,4,1,IJOB,N)                         THERMO    1326
                IF(IC.LT.1) GO TO 20                                              THERMO    1327
                CALL FRAMEV(3)                                                    THERMO    1328
                CALL CLASSG(IC)                                                   THERMO    1329
                KK=0                                                              THERMO    1330
                IF(IR.LT.10) GO TO 11                                             THERMO    1331
                NN=1                                                              THERMO    1332
                MM=IR-10                                                          THERMO    1333
                GO TO 12                                                          THERMO    1334
            11  IF(IR.EQ.1) GO TO 18                                              THERMO    1335
                IF(ID.EQ.6) KK=-2                                                 THERMO    1336
                MM=IR+3+KK                                                        THERMO    1337
                NN=5+KK                                                           THERMO    1338
            12  DO 13 I=NN,MM                                                     THERMO    1339
            13  READ(4,902) (IRITE(L,I),L=1,8)                                    THERMO    1340
           902  FORMAT(8A10)                                                      THERMO    1341
            18  IF(ID.LT.7) GO TO 20                                              THERMO    1342
                ID=1                                                              THERMO    1343
                ICAT=2H                                                           THERMO    1344
            20  CALL CHSIZV(2,2)                                                  THERMO    1345
                CALL RITSTV(12,18,TABL1V)                                         THERMO    1346
                CALL RITE2V(450,420,1023,90,1,11,-1,11HPREPARED BY,N)             THERMO    1347
                CALL RITE2V(350,400,1023,90,1,31,-1,31HFREEMAN MATHEMATICAL LABORA THERMO    1348
               1TORY,N)                                                           THERMO    1349
                CALL RITE2V(350,300,1023,90,1,28,-1,28HTSX, EGLIN A. F. B., FLORID THERMO    1350
               1A,N)                                                              THERMO    1351
                CALL RITE2V(460,300,1023,90,1,10,1,IDAY,N)                        THERMO    1352
```

```
      CALL CHSIZV(3,3)
      CALL RITSTV(18,26,TABL1V)
      CALL RITE2V(420,280,1023,90,1,10,1,IPROJ,N)
      CALL RITE2V(420,240,1023,90,1,10,1,IMSN,N)
      CALL RITE2V(420,200,1023,90,1,10,1,IDATE,N)
      CALL RITE2V(420,160,1023,90,1,10,1,IRUN,N)
      IF(IC.LT.1) RETURN
      CALL CHSIZV(2,2)
      CALL RITSTV(12,18,TABL1V)
      IF(IE.LT.1) GO TO 160
      IF(IE-2)130,140,150
C**** FROM DOD 5200.1-R PARA 4-601
  130 CALL RITE2V(420,900,1023,90,1,15,-1,15HRESTRICTED DATA,N)
      GO TO 160
C**** FROM DOD 5200.1-R PARA 4-602
  140 CALL RITE2V(380,900,1023,90,1,24,-1,24HFORMERLY RESTRICTED DATA,N)
      GO TO 160
C**** FROM DOD 5200.1-R PARA 4-603
  150 CALL RITE2V(330,900,1023,90,1,29,-1,29HNATIONAL SECURITY INFORMATI
     1ON,N)
  160 IF(IN.LT.1) GO TO 170
C**** FROM DOD 5200.1-R PARA 4-605
      CALL RITE2V(400,840,1023,90,1,17,-1,17HNO FOREIGN DISSEM,N)
  170 IF(IW.LT.1) GO TO 180
C**** FROM DOD 5200.1-R PARA 4-604
      CALL RITE2V(420,780,1023,90,1,14,-1,14HWARNING NOTICE,N)
      CALL RITE2V(370,760,1023,90,1,22,-1,22HSENSITIVE INTELLIGENCE,N)
      CALL RITE2V(340,740,1023,90,1,28,-1,28HSOURCES AND METHODS INVOLVE
     1D,N)
  180 IF(IR.GT.10) GO TO 100
      ENCODE(80,902,IRITE(1,1)) IA(1),IA(2),IAUTHR
      GO TO (30,30,30,30,31,32) ID
   30 ENCODE(80,902,IRITE(1,2)) (IA(L),L=3,7)
      GO TO 33
   31 ENCODE(80,902,IRITE(1,2)) IA(9),IA(10),(IA(L),L=5,7)
   33 ENCODE(80,902,IRITE(1,3)) (IA(L),L=11,13)
      GO TO (40,40,40,40,41,32) ID
   32 ENCODE(80,902,IRITE(1,2)) IA(8),(IA(L),L=4,7)
      KKK=3
      GO TO 60
   40 ENCODE(80,902,IRITE(1,4)) IA(14),IA(15),ICAT
      GO TO 50
   41 ENCODE(80,902,IRITE(1,4)) (IA(L),L=16,20)
   50 KKK=5
   60 IF(IR.GT.1) GO TO 100
      IF(M.EQ.1HU)ENCODE(80,902,IRITE(1,KKK)) (IA(L),L=21,26)
      IF(M.EQ.1HN)ENCODE(80,902,IRITE(1,KKK)) (IA(L),L=27,30)
      IF(M.EQ.1H )ENCODE(80,902,IRITE(1,KKK)) IA(21),IA(22),IDCLAS
  100 NY=700
      IF(IR.EQ.1) MM=KKK
      DO 80 L=1,MM
      CALL RITE2V(80,NY,1023,90,1,80,1,IRITE(1,L),N)
   80 NY=NY-20
  200 RETURN
  300 IF(IR.LT.1.OR.IR.GT.19) RETURN
      CALL FRAMEV(3)
      IF(IC.LT.1) GO TO 310
```

```
   119          CALL CLASSG(IC)                                              THERMO   1410
            310 CALL CHSIZV(5,5)                                             THERMO   1411
                CALL RITSTV(29,39,TABL1V)                                    THERMO   1412
                CALL RITE2V(430,600,1023,90,2,3,-1,3HEND,N)                  THERMO   1413
                CALL RITE2V(430,400,1023,90,2,4,1,IJOB,N)                    THERMO   1414
   120          CALL FRAMEV(3)                                               THERMO   1415
                RETURN                                                       THERMO   1416
                END                                                          THERMO   1417
```

```
      SUBROUTINE SECURE      74/74    OPT=1    TRACE                   FTN 4.2+74355       09/29/76  12.58.37.        PAGE     4

      SYMBOLIC REFERENCE MAP (R=1)

 ENTRY POINTS
     3  SECURE

 VARIABLES       SN   TYPE              RELOCATION
   1165  I            INTEGER                                  1307  IA        INTEGER     ARRAY
   1171  IAUTHF       INTEGER      ARRAY                       1142  IC        INTEGER
   1160  ICAT         INTEGER                                  1144  IO        INTEGER
   1153  IDATE        INTEGER                                  1155  IDAY      INTEGER
   1156  IDCLAS       INTEGER                                  1145  IE        INTEGER
      0  IFLAG        INTEGER                 F.P.             1150  IJOB      INTEGER
   1152  IMSN         INTEGER                                  1147  IN        INTEGER
   1151  IPROJ        INTEGER                                  1143  IR        INTEGER
   1177  IRITE        INTEGER      ARRAY                       1154  IRUN      INTEGER
   1146  IW           INTEGER                                     0  K         INTEGER     ARRAY     F.P.
   1162  KK           INTEGER                                  1167  KKK       INTEGER
   1166  L            INTEGER                                  1157  M         INTEGER
   1164  MM           INTEGER                                  1161  N         INTEGER
   1163  NN           INTEGER                                  1170  NY        INTEGER

 FILE NAMES          MODE
          TAPE4      FMT

 EXTERNALS           TYPE   ARGS
          CHSIZV              2                                      CLASSG            1
          FRAMEV              1                                      RITE2V            9
          RITSTV              3                                      TABL1V            0

 STATEMENT LABELS
     32  10                                   56  11                                        67  12
      0  13                                  102  18                                        26  19
    107  20                                  223  30                                       226  31
    244  32                                  230  33                                       250  40
    293  41                                  255  50                                       256  60
      0  80                                  302  100                                        0  130     INACTIVE
    160  140                                 164  150                                      167  160
    173  170                                 205  180                                        0  200     INACTIVE
    321  300                                 332  310                                      734  900  FMT
    746  901   FMT                           765  902   FMT                                720  1000 FMT
    756  1002  FMT

 STATISTICS
   PROGRAM LENGTH                 1422B    786
```

```
SUBROUTINE CLASSG       74/74    OPT=1    TRACE                          FTN 4.2+74355      09/29/76  12.58.40.        PAGE     1

              SUBROUTINE CLASSG(I)                                                    THERMO  1418
              DIMENSION IC(2)                                                         THERMO  1419
              EXTERNAL TABL1V                                                         THERMO  1420
              DATA ITS,IS,IC/10HTOP SECRET ,7H SECRET ,10HCONFIDENTI ,3HAL    /       THERMO  1421
              CALL CHSIZV(5,5)                                                        THERMO  1422
              CALL RITSTV(25,35,TABL1V)                                               THERMO  1423
              IF(I-2)30,20,10                                                         THERMO  1424
           10 CALL RITE2V(400,990,1023,90,2,10,1,ITS,N)                               THERMO  1425
              CALL RITE2V(400,040,1023,90,2,10,1,ITS,N)                               THERMO  1426
              RETURN                                                                  THERMO  1427
           20 CALL RITE2V(430,040,1023,90,2,7,1,IS,N)                                 THERMO  1428
              CALL RITE2V(430,990,1023,90,2,7,1,IS,N)                                 THERMO  1429
              RETURN                                                                  THERMO  1430
           30 CALL RITE2V(370,950,1023,90,2,13,1,IC,N)                                THERMO  1431
              CALL RITE2V(370,040,1023,90,2,13,1,IC,N)                                THERMO  1432
              RETURN                                                                  THERMO  1433
              END                                                                     THERMO  1434


SUBROUTINE CLASSG       74/74    OPT=1    TRACE                          FTN 4.2+74355      09/29/76  12.58.40.        PAGE     2

   SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS
   3  CLASSG

VARIABLES      SN  TYPE             RELOCATION
    0  I           INTEGER               F.P.          137  IC          INTEGER     ARRAY
  136  IS          INTEGER                             135  ITS         INTEGER
  156  N           INTEGER

EXTERNALS              TYPE    ARGS
   CHSIZV                        2                            RITE2V                9
   RITSTV                        3                            TABL1V                0

STATEMENT LABELS
    0  10          INACTIVE                 20  20                                   25  30

STATISTICS
  PROGRAM LENGTH                1618     113
```

```
               SUBROUTINE GETPIC                                              THERMO  1435
       C**** THIS SUBROUTINE READS AND FINDS NEXT THERMOVISION PICTURE.       THERMO  1436
       C      THE PICTURE IS RE-ORDERED AS PER LINE NUMBER.                   THERMO  1437
             COMMON IBEFOR(7),IAFTER(7),ITOP,IPICT(10100)                     THERMO  1438
       C                                                                      THERMO  1439
              COMMON/PDPFT/NWS,NSR,ONE,IEND,JSTOP,START,STOP,ICKSTR,ICKSTP    THERMO  1440
            . ,IVALID,ICALIS,INPT                                             THERMO  1441
              DIMENSION IN(256),MTAB(15),ITIM(15),TIME(5),IGCODE(4)           THERMO  1442
              EQUIVALENCE (IT1,T1),(IT2,T2)                                   THERMO  1443
              DATA MTAB/14*18,0/,IFIRST/1/                                    THERMO  1444
              DATA IGCODE/1,4,3,2/                                            THERMO  1445
                                                                              THERMO  1446
              IF(IFIRST.NE.1)GO TO 25                                         THERMO  1447
             TLAST=0.0                                                        THERMO  1448
             IFIRST=0                                                         THERMO  1449
       10     LNUM=NWS*NSR                                                    THERMO  1450
             KNUM=LNUM/10                                                     THERMO  1451
             IF(MOD(LNUM,10).EQ.0)GO TO 15                                    THERMO  1452
             KNUM=KNUM+1                                                      THERMO  1453
             LNUM=KNUM*10                                                     THERMO  1454
       15     CONTINUE                                                        THERMO  1455
             NCHAR=3*LNUM+9*NSR                                               THERMO  1456
              IF(MOD(NCHAR,6).NE.0)NCHAR=NCHAR+3                              THERMO  1457
             NT=(LNUM*18)/60+1                                                THERMO  1458
             ICH=MOD(NCHAR,30)                                                THERMO  1459
             IF(NCHAR.NE.0)NCHAR=NCHAR+30-ICH                                 THERMO  1460
             ILWD=NCHAR/10+1                                                  THERMO  1461
              IBAD=0                                                          THERMO  1462
                                                                              THERMO  1463
       25    CONTINUE                                                         THERMO  1464
       CCC     IBAD=0                                                         THERMO  1465
       CCC    ICOUNT=0                                                        THERMO  1466
              IDTYP=0                                                         THERMO  1467
             JEND=0                                                           THERMO  1468
             LINCNT=0                                                         THERMO  1469
             IDUM=2                                                           THERMO  1470
              IREC=NSR                                                        THERMO  1471
             DO 80 I=1,10100                                                  THERMO  1472
        80      IPICT(I)=-1                                                   THERMO  1473
              INPT=0                                                          THERMO  1474
       100    CONTINUE                                                        THERMO  1475
              LINSAV=LINCNT                                                   THERMO  1476
              IDSAV=IDTYP                                                     THERMO  1477
             IF(IREC.LT.NSR)GO TO 150                                         THERMO  1478
       101    CALL RDMODE(11,IN,NCHAR,ICODE,ICS)                              THERMO  1479
             IF(ICODE.EQ.2.AND.ICS.EQ.2150)GO TO 110                          THERMO  1480
              IF(ICODE.NE.0)IBAD=IBAD+1                                       THERMO  1481
              IF(ICODE.NE.0.AND.IBAD.LT.200)PRINT 10111,NCHAR,ICODE,ICS,IBAD  THERMO  1482
       10111  FORMAT(' I/P TAPE ERROR, NCHAR=',I5,' ICODE=',I5,' ICS=',I5,I5) THERMO  1483
             IF(ICODE)105,110,108                                             THERMO  1484
       105    IF(ICODE.EQ.-888)GO TO 101                                      THERMO  1485
             GO TO 999                                                        THERMO  1486
       108   CONTINUE                                                         THERMO  1487
             IF(ICODE.EQ.4.AND.IN(ILWD).EQ.10H*END*TAPE*)                     THERMO  1488
            1CALL DONE(11)                                                    THERMO  1489
             IF(MOD(ICODE,2).EQ.0)GO TO 110                                   THERMO  1490
              GO TO 101                                                       THERMO  1491
```

```
110    CONTINUE
        JEND=0
       IREC=0
C****  CHECK TO SEE IF THIS RECORD CONTAINS SAMPLES WITHIN START/STOP.
C      IF SO, THEN BREAK OUT NSR TIME WORDS.

       ITSEC=SHIFT(IN(NT),-42).AND.777777B
       ITMSEC=SHIFT(IN(NT),-24).AND.777777B
        TIME(1)=ITSEC*1000+ITMSEC
       TT1=TIME(1)-START
       TT2=ABS(TIME(1)-STOP)
       IF(TT1.GT.0)ICKSTR=0
        IF(TT2.LT.10000.)ICKSTP=1
       IF(ICKSTP)112,112,111
111    CONTINUE
       TT3=TIME(1)-TLAST
        IF(TLAST.NE.0.0.AND.TT3.GT.10000.)GO TO 112
       IF(TIME(1).GT.STOP)GO TO 990
112     CONTINUE
       JSTOP=0
        TIM2=TIME(1)+NSR*ONE
CCC     ICOUNT=ICOUNT+1
CCC     IF(MOD(ICOUNT,100).EQ.0)PRINT 10112,IN(NT),ITSEC,ITMSEC,TIME(1)
CC10112  FORMAT(1X,O21,2I10,3F10.0)
       IF(ICKSTR)114,114,113
113     CONTINUE
       IF(TIM2.LT.START)GO TO 101
114     CONTINUE
        TLAST=TIME(1)
C***  THIS RECORD CONTAINS SAMPLES BETWEEN START AND STOP. BUILD TIME ARR
       DO 115 I=1,NSR
       TIME(I)=(I-1)*ONE+TIME(1)
115    CONTINUE
        IFRM =SHIFT(IN(NT),-6).AND.777777B
       IF(IFRM.GE.NSR)GO TO 150
       CALL UNPACK(IN(NT),MTAB,ITIM)
       II=4
       DO130 I=2,NSR
        IF(IFRM.GE.I)GO TO 130
        TIME(I)=ITIM(II)*1000.+ITIM(II+1)
       IFRM=ITIM(II+2)
       II=II+3
       L=0
       IF(IFRM.LT.I.OR.IFRM.GT.NSR)GO TO 130
        DO 125 J=I,IFRM
       L=L+1
       TIME(J)=(L-1)*ONE+TIME(I)
125     CONTINUE
130     CONTINUE

150     CONTINUE
       IREC=IREC+1
       INDX=IREC*42
C****  GET LINE COUNT AND DATA TYPE

        IDTYP=SHIFT(IN(INDX),-18).AND.3B
        LINCNT=SHIFT(IN(INDX),-20).AND.377B
```

```
      IF(IDTYP.EQ.0)GO TO 200
      IF(IOSAV.EQ.0)GO TO 190
C**** THIS IS A LINE OF PICTURE.  LINE NUMBER=LAST LINE COUNT
155   CONTINUE
C**** IF VALID DATA BIT NOT ON, DO NOT PROCESS
      IF(IVAL.NE.IVALID.AND.IVALID.NE.2)GO TO 100
       INPT=INPT+1
      IF(LINSAV.LT.ITOP)GO TO 100
       I=(LINSAV-ITOP)*100+1
       IF(I.GT.9901)I=9901
      IND=INDX-41
       IND2=IND+29
      DO 160 J=IND ,IND2,3
      IWD1=IN(J)
      IWD2=IN(J+1)
      IWD3=IN(J+2)
      IPICT(I)=SHIFT(IWD1,-42).AND.1777B
      IPICT(I+1)=SHIFT(IWD1,-24).AND.1777B
      IPICT(I+2)=SHIFT(IWD1,- 6).AND.1777B
      IPICT(I+3)=SHIFT(IWD2,-48).AND.1777B
      IPICT(I+4)=SHIFT(IWD2,-30).AND.1777B
      IPICT(I+5)=SHIFT(IWD2,-12).AND.1777B
      IPICT(I+6)=(SHIFT(IWD2,6).AND.1700B) .OR.(SHIFT(IWD3,-54).AND.77B)
      IPICT(I+7)=SHIFT(IWD3,-36).AND.1777B
      IPICT(I+8)=SHIFT(IWD3,-18).AND.1777B
      IPICT(I+9)=IWD3.AND.1777B
       I=I+10
160   CONTINUE
C**** CHECK THIS LINE FOR CONSTANT VALUES.  IF 30 OR MORE WORDS
C    CONSECUTIVELY HAVE THE SAME VALUE, THEN SET THOSE VALUES TO ZERO
      IXX1=I-100
      IXX2=I-1
       ICOUNT=IPICT(IXX1)
       IW=0
       DO 165 JJ=IXX1,IXX2
      IW=IW+1
       IF(IPICT(JJ).EQ.ICOUNT.AND.IPICT(JJ).GT.128)GO TO 165
       GO TO 167
165    CONTINUE
167     CONTINUE
       IF(IW.LT.30)GO TO 100
       IXX2=IXX1+IW-1
       DO 168 JJ=IXX1,IXX2
       IPICT(JJ)=-1
168     CONTINUE
        GO TO 100
      GO TO 100
190   CONTINUE
C*** THIS IS FIRST DUMMY RECORD BEFORE PICTURE. GET TIME AND SETTINGS.
      T1=TIME(IREC)
      IND=INDX-41
      IFIL=SHIFT(IN(IND),-49).AND.7B
      IAP =SHIFT(IN(IND),-46).AND.7B
      IVID=SHIFT(IN(IND),-44).AND.3B
      ICAL=SHIFT(IN(IND),-43).AND.1B
      IVAL=SHIFT(IN(IND),-42).AND.1B
      IBEFOR(2)=7-IFIL
```

```
      SUBROUTINE GETPIC      74/74    OPT=1    TRACE                  FTN 4.2+74355      09/29/76  12.58.42.      PAGE    4

            IBEFOR(3)=7-IAP                                                        THERMO   1606
            IBEFOR(4)=IGCODE(IVID+1)                                               THERMO   1607
            IBEFOR(5)=ICAL                                                         THERMO   1608
            IBEFOR(6)=IVAL                                                         THERMO   1609
            GO TO 100                                                              THERMO   1610
  200        CONTINUE                                                              THERMO   1611
            IACL1=IACL2                                                            THERMO   1612
            IACL2=LINCNT                                                           THERMO   1613
            IF(IDSAV.EQ.0)GO TO 250                                                THERMO   1614
            IDUM=0                                                                 THERMO   1615
             GO TO 155                                                             THERMO   1616
  250       CONTINUE                                                               THERMO   1617
            IDUM=IDUM+1                                                            THERMO   1618
            IF(IDUM.GT.1)GO TC 100                                                 THERMO   1619
C**** THIS IS FIRST DUMMY RECORD AFTRF PICTURE. STORE SETTINGS                      THERMO   1620
             T2=TIME(IREC)                                                         THERMO   1621
            IND=INDX-41                                                            THERMO   1622
            IFIL=SHIFT(IN(IND),-49).AND.7B                                         THERMO   1623
            IAP =SHIFT(IN(IND),-46).AND.7B                                         THERMO   1624
            IVID=SHIFT(IN(IND),-44).AND.3B                                         THERMO   1625
            ICAL=SHIFT(IN(IND),-43).AND.1B                                         THERMO   1626
            IVAL=SHIFT(IN(IND),-42).AND.1B                                         THERMO   1627
            IAFTER(2)=7-IFIL                                                       THERMO   1628
            IAFTER(3)=7-IAP                                                        THERMO   1629
            IAFTER(4)=IGCODE(IVID+1)                                               THERMO   1630
            IAFTER(5)=ICAL                                                         THERMO   1631
            IAFTER(6)=IVAL                                                         THERMO   1632
             GO TO 700                                                             THERMO   1633
                                                                                   THERMO   1634
  700       CONTINUE                                                               THERMO   1635
C**** CHECK TO SEE IF PICTURE IS VALID                                              THERMO   1636
            IF(IBEFOR(6).NE.IVALID.AND.IVALID.NE.2)GO TO 100                       THERMO   1637
             IF(ICALIB.EQ.1.AND.ICAL.EQ.0)GO TO 100                                THERMO   1638
            DO 710 I=2,6                                                           THERMO   1639
            IF(IBEFOR(I).NE.IAFTER(I))GO TO 100                                    THERMO   1640
  710       CONTINUE                                                               THERMO   1641
            IBEFOR(7)=IACL1                                                        THERMO   1642
            IAFTER(7)=IACL2                                                        THERMO   1643
            IBEFOR(1)=IT1                                                          THERMO   1644
            IAFTER(1)=IT2                                                          THERMO   1645
  800       RETURN                                                                 THERMO   1646
  990        CONTINUE                                                              THERMO   1647
             JSTOP=1                                                               THERMO   1648
            GO TO 800                                                              THERMO   1649
  999       CONTINUE                                                               THERMO   1650
            JEND=JEND+1                                                            THERMO   1651
            IF(JEND.LT.2)GO TC 101                                                 THERMO   1652
            IEND=IEND+1                                                            THERMO   1653
            GO TO 800                                                              THERMO   1654
            END                                                                    THERMO   1655
```

CARD NR.	SEVERITY	DETAILS	DIAGNOSIS OF PROBLEM
101	I		THERE IS NC PATH TO THIS STATEMENT.

```
        SUBROUTINE GETPIC      74/74    OPT=1    TRACE                FTN 4.2+74355       09/29/76  12.58.42.       PAGE     6

        SYMBOLIC REFERENCE MAP (R=1)

   ENTRY POINTS
      1   GETPIC

   VARIABLES       SN  TYPE             RELOCATION
     736  I              INTEGER                               779  IACL1      INTEGER
     776  IACL2          INTEGER                                 7  IAFTER     INTEGER    ARRAY     / /
     772  IAP            INTEGER                               730  IBAD       INTEGER
       0  IBEFOR         INTEGER     ARRAY      / /            774  ICAL       INTEGER
      12  ICALIB         INTEGER                PDPFT          726  ICH        INTEGER
      10  ICKSTP         INTEGER                PDPFT            7  ICKSTR     INTEGER              PDPFT
     741  ICODE          INTEGER                               760  ICOUNT     INTEGER
     742  ICS            INTEGER                               740  IDSAV      INTEGER
     731  IDTYP          INTEGER                               734  IDUM       INTEGER
       3  IEND           INTEGER                PDPFT          771  IFIL       INTEGER
     671  IFIRST         INTEGER                               751  IFRM       INTEGER
    1444  IGCODE         INTEGER     ARRAY                     752  II         INTEGER
     727  ILWD           INTEGER                              1001  IN         INTEGER    ARRAY
     757  IND            INTEGER                               755  INDX       INTEGER
     760  IND2           INTEGER                                13  INPT       INTEGER              PDPFT
      17  IPICT          INTEGER     ARRAY      / /            735  IREC       INTEGER
    1420  ITIM           INTEGER     ARRAY                     744  ITMSEC     INTEGER
      16  ITOP           INTEGER                / /            743  ITSEC      INTEGER
     777  IT1            INTEGER                              1000  IT2        INTEGER
     756  IVAL           INTEGER                                11  IVALID     INTEGER              PDPFT
     773  IVID           INTEGER                               767  IW         INTEGER
     761  IWD1           INTEGER                               762  IWD2       INTEGER
     763  IWD3           INTEGER                               764  IXX1       INTEGER
     765  IXX2           INTEGER                               754  J          INTEGER
     732  JEND           INTEGER                               770  JJ         INTEGER
       4  JSTOP          INTEGER                PDPFT          723  KNUM       INTEGER
     753  L              INTEGER                               733  LINCNT     INTEGER
     737  LINSAV         INTEGER                               722  LNUM       INTEGER
    1401  MTAB           INTEGER     ARRAY                     724  NCHAR      INTEGER
       1  NSR            INTEGER                PDPFT          725  NT         INTEGER
       0  NWS            INTEGER                PDPFT            2  ONE        REAL                 PDPFT
       5  START          REAL                   PDPFT            6  STOP       REAL                 PDPFT
    1437  TIME           REAL        ARRAY                     750  TIM2       REAL
     721  TLAST          REAL                                  745  TT1        REAL
     746  TT2            REAL                                  747  TT3        REAL
     777  T1             REAL                                 1000  T2         REAL

   FILE NAMES          MODE
          OUTPUT       FMT

   EXTERNALS           TYPE    ARGS
          ABS          REAL      1                                  DONE              1
          MOD          INTEGER   2                                  FBMODE            5
          SHIFT        NO TYPE   2                                  UNPACK            3

   STATEMENT LABELS
       0  10           INACTIVE            16  15                                       43  25
       0  80                               54  100                                      61  101
       0  105          INACTIVE           104  108                                     116  110
       0  111          INACTIVE           161  112                                       0  113         INACTIVE
     176  114                               6  115                                       0  125
```

```
 SUBROUTINE GETPIC      74/74   OPT=1   TRACE                FTN 4.2+74355      09/29/76  12.58.42.      PAGE    7

STATEMENT LABELS
  241  130                        244  190                                           284  195
    0  160                        416  165                                           420  167
    0  168                        431  190                                           502  200
  507  250                          0  700        INACTIVE                             0  710
  636  800                        607  990                                           611  999
  701  10111   FMT

COMMON BLOCKS    LENGTH
      / /        10115
     PDPFT          12

STATISTICS
  PROGRAM LENGTH              1450B      808
  CM LABELED COMMON LENGTH      14B       12
  CM BLANK COMMON LENGTH    23603B     10115
```

```
      SUBROUTINE PLT3D                                                  THERMO   1656
C                                                                       THERMO   1657
C**** THIS SUBROUTINE WILL MAKE OBLIQUE PLOT OF V VS W FUNCTION FOR      THERMO   1658
C     A GIVEN U.                                                        THERMO   1659
C                                                                       THERMO   1660
C     U= VALUE OF INDEPENDENT VARIABLE U FOR A GIVEN V VS W FUNCTION.    THERMO   1661
C     VA = ONE DIMENSIONAL ARRAY CONTAINING INDEPENDENT VARIABLE V.     THERMO   1662
C     WA=ONE DIMENSIONAL ARRAY CONTAINING DEPENDENT VARIABLE W.         THERMO   1663
C                                                                       THERMO   1664
C                    WA(I)= F(U,VA(I))                                  THERMO   1665
C     IPASS=N INDICATES EVERY NTH POINT ON THIS CURVE TO NTH POINT OF   THERMO   1666
C             PREVIOUS CURVE.                                           THERMO   1667
C     IPASS=-1 IF THIS IS FIRST CALL FOR NEW FRAME.                     THERMO   1668
C     IPASS=N INDICATES EVERY NTH POINT ON THIS CURVE TO NTH POINT OF   THERMO   1669
C             PREVIOUS CURVE BE CONNECTED.                              THERMO   1670
C     NPTS= NO. OF PTS IN VA, WA ARRAYS.                                THERMO   1671
C                                                                       THERMO   1672
C                                                                       THERMO   1673
      COMMON IBEFOR(7),IAFTER(7),ITOP,IPICT(10100)                      THERMO   1674
       COMMON/MAXVAL/UFOR,UBACK,VLEFT,VRIGHT,WBOT,WTOP,THETA,           THERMO   1675
     .  UAXIS,VAXIS,UVPLNE ,IU(2,2),IV(2,2),IW(2,2)                     THERMO   1676
       COMMON/PLIM/IFOR,IBACK,ILEFT,IRIGHT,IVIEW,IPASS                  THERMO   1677
C                                                                       THERMO   1678
C     MAXVAL COMMON IS USED FOR DETERMING SCALES.                       THERMO   1679
C     UFOR=EXTREME VALUE OF U FOR FOREGROUND.                           THERMO   1680
C     UBACK= EXTREME VALUE OF U FOR BACKGROUND.                         THERMO   1681
C     VLEFT= LEFT MOST VALUE OF V.                                      THERMO   1682
C     VRIGHT= RIGHT MOST VALUE OF V                                     THERMO   1683
C     WBOT=MIN VALUE OF W.                                              THERMO   1684
C     WTOP=MAX VALUE OF W                                               THERMO   1685
C     THETA=ANGLE OF OBLIQUE AXIS WITH VERTICAL (RADIANS).  NOTE- IF THIS THERMO 1686
C     IS ZERO. THEN PLOT WILL BE TWO DIMENSIONAL WITH U AND W AXES CO-  THERMO   1687
C     INCIDENT.                                                         THERMO   1688
C     UAXIS= VALUE OF V AT WHICH UAXIS IS TO BE DRAWN.                  THERMO   1689
C     VAXIS= VALUE OF U AT WHICH V AXIS IS TO BE DRAWN.                 THERMO   1690
C     UVPLNE= VALUE OF W AT WHICH UAXIS AND VAXIS INTERSECT.            THERMO   1691
C                                                                       THERMO   1692
      DIMENSION IXSAV(120),IYSAV(120)                                   THERMO   1693
      DIMENSION MINY(1024),MAXY(1024)                                   THERMO   1694
       DIMENSION R(10)                                                  THERMO   1695
       EQUIVALENCE (R(3),A),(R(5),B),(R(4),C),(R(6),D)                  THERMO   1696
      LOGICAL IOUT                                                      THERMO   1697
      IF(IPASS.NE.-5)CALL FRAMEV(3)                                     THERMO   1698
C**** IF FIRST PASS, ADVANCE FRAME, SET SCALES, AND INITIALIZE MAX AND   THERMO   1699
C     MIN FUNCTIONS.   THE FIRST CURVE TO BE PLOTTED WILL BE THE FARTHEST THERMO  1700
C     IN THE FOREGROUND.    SUCCEEDING VALUES OF U MUST BE EITHER       THERMO   1701
C     ASCENDING OF DESCENDING.                                          THERMO   1702
C                                                                       THERMO   1703
C**** FIND SCALE VALUES TO MAKE VARIABLES PROPORTIONAL                   THERMO   1704
      ULNTH=ABS(UFOR-UBACK)                                             THERMO   1705
      VLNTH=ABS(VRIGHT-VLEFT)                                           THERMO   1706
      WLNTH=ABS(WTOP-WBOT)                                              THERMO   1707
      SCMIN=AMIN1(ULNTH,VLNTH,WLNTH)                                    THERMO   1708
      SCALU=SCMIN/ULNTH                                                 THERMO   1709
      SCALV=SCMIN/VLNTH                                                 THERMO   1710
      SCALW=SCMIN/WLNTH                                                 THERMO   1711
        IF(IPASS.NE.-3)GO TO 19                                         THERMO   1712
```

```
                SCALU=1.                                                  THERMO    1713
                SCALV=1.                                                  THERMO    1714
                SCALW=1.                                                  THERMO    1715
          19    CONTINUE                                                  THERMO    1716
                ULNTH=ULNTH*SCALU                                         THERMO    1717
                 DIFX=ULNTH*SIN(THETA)                                    THERMO    1718
                 IF(VRIGHT.LT.VLEFT)DIFX=-DIFX                            THERMO    1719
                IF(THETA.GE.0.0)GC TO 20                                  THERMO    1720
                XRIGHT=VRIGHT*SCALV                                       THERMO    1721
                XLEFT=VLEFT*SCALV+DIFX                                    THERMO    1722
                 GO TO 30                                                 THERMO    1723
          20     CONTINUE                                                 THERMO    1724
                XLEFT=VLEFT*SCALV                                         THERMO    1725
                XRIGHT=VRIGHT*SCALV+DIFX                                  THERMO    1726
          30     CONTINUE                                                 THERMO    1727
                YTOP=(WTOP-WBOT)*SCALW+ULNTH*COS(THETA)+WBOT*SCALW        THERMO    1728
                YBOT=WBOT*SCALW                                           THERMO    1729
                YSCALE=YTOP-YBOT                                          THERMO    1730
                XSCALE=ABS(XRIGHT-XLEFT)                                  THERMO    1731
                CALL XSCALV(XLEFT,XRIGHT,50,50)                           THERMO    1732
                CALL YSCALV(YBOT,YTOP,50,50)                              THERMO    1733
          C**** GET SCALING INFO TO ELIMINATE NXV,NYV CALLS               THERMO    1734
                                                                          THERMO    1735
                 CALL SCLSAV(R)                                           THERMO    1736
          C**** CONSTRUCT THE AXES.                                       THERMO    1737
          C                                                               THERMO    1738
          C     (V AXIS)                                                  THERMO    1739
                DELU=ABS(VAXIS-UFGR)*SCALU                                THERMO    1740
                DX=DELU*SIN(THETA)                                        THERMO    1741
                IDELX=(DX/XSCALE)*924.                                    THERMO    1742
                DY=DELU*COS(THETA)                                        THERMO    1743
                IDELY=(DY/YSCALE)*924.                                    THERMO    1744
                IX1=NXV(VLEFT*SCALV)+IDELX                                THERMO    1745
                IY1=NYV(UVPLNE*SCALW)+IDELY                               THERMO    1746
                IX2=NXV(VRIGHT*SCALV)+IDELX                               THERMO    1747
                IY2=IY1                                                   THERMO    1748
                CALL LINEV(IX1,IY1,IX2,IY2)                               THERMO    1749
                IV(1,1)=IX1                                               THERMO    1750
                IV(2,1)=IY1                                               THERMO    1751
                 IV(1,2)=IX2                                              THERMO    1752
                IV(2,2)=IY2                                               THERMO    1753
          C                                                               THERMO    1754
          C     (W AXIS)                                                  THERMO    1755
                IX1=NXV(UAXIS*SCALV)+IDELX                                THERMO    1756
                IX2=IX1                                                   THERMO    1757
                IY1=NYV(WBOT*SCALW)+IDELY                                 THERMO    1758
                IY2=NYV(WTOP*SCALW)+IDELY                                 THERMO    1759
                CALL LINEV(IX1,IY1,IX2,IY2)                               THERMO    1760
                 IW(1,1)=IX1                                              THERMO    1761
                 IW(2,1)=IY1                                              THERMO    1762
                 IW(1,2)=IX2                                              THERMO    1763
                 IW(2,2)=IY2                                              THERMO    1764
          C                                                               THERMO    1765
          C     (U AXIS)                                                  THERMO    1766
          C                                                               THERMO    1767
                IX1=NXV(UAXIS*SCALV)                                      THERMO    1768
                IY1=NYV(UVPLNE*SCALW)                                     THERMO    1769
```

```
                Y2=ULNTH*COS(THETA)+UVPLNE*SCALW                        THERMO    1770
                 X2=DIFX+UAXIS*SCALV                                    THERMO    1771
                IX2=NXV(X2)                                             THERMO    1772
                IY2=NYV(Y2)                                             THERMO    1773
                CALL LINEV(IX1,IY1,IX2,IY2)                             THERMO    1774
                 IU(1,1)=IX1                                            THERMO    1775
                IU(2,1)=IY1                                             THERMO    1776
                 IU(1,2)=IX2                                            THERMO    1777
                 IU(2,2)=IY2                                            THERMO    1778
          C                                                             THERMO    1779
          100    CONTINUE                                               THERMO    1780
                 IF(IPASS.EQ.-5)RETURN                                  THERMO    1781
                 IPASS=IABS(IPASS)                                      THERMO    1782
          C**** INITIALIZE VALUES                                       THERMO    1783
                 DO 60 I=1,1024                                         THERMO    1784
                MINY(I)=1000                                            THERMO    1785
                MAXY(I)=0                                               THERMO    1786
                 IF(I.GT.120)GO TC 60                                   THERMO    1787
                 IXSAV(I)=0                                             THERMO    1788
                 IYSAV(I)=0                                             THERMO    1789
          60    CONTINUE                                                THERMO    1790
                 NCURV=IABS(IF(R-IBACK)+1                               THERMO    1791
                NPTS=IABS(IRIGHT-ILEFT)                                 THERMO    1792
                 INDX1=ISIGN(1,(IFOR-IBACK))                            THERMO    1793
                 INDX2=ISIGN(1,(IRIGHT-ILEFT))                          THERMO    1794
                 DO 700 ICU=1,NCURV                                     THERMO    1795
                 IF(ICU-NCURV)62,61,61                                  THERMO    1796
          61    U=UBACK                                                 THERMO    1797
                GO TO 63                                                THERMO    1798
          62     CONTINUE                                               THERMO    1799
                U=IFOR-INDX1*(ICU-1)                                    THERMO    1800
          63    CONTINUE                                                THERMO    1801
                DELU=ABS(U-UFOR)*SCALU                                  THERMO    1802
                DX=DELU*SIN(THETA)                                      THERMO    1803
                IDELX=(DX/XSCALE)*924.                                  THERMO    1804
                DY=DELU*COS(THETA)                                      THERMO    1805
                IDELY=(DY/YSCALE)*924.                                  THERMO    1806
                ICUT=.TRUE.                                             THERMO    1807
                 J=NPTS+1                                               THERMO    1808
                 DO 180 JJ=1,NPTS                                       THERMO    1809
                 IF(THETA)110,120,120                                   THERMO    1810
          110     J=JJ                                                  THERMO    1811
                 GO TO 125                                              THERMO    1812
          120     J=J-1                                                 THERMO    1813
          125    CONTINUE                                               THERMO    1814
                IVA=ILEFT+(J-1)*INDX2                                   THERMO    1815
                 III=U                                                  THERMO    1816
                 JJJ=IVA                                                THERMO    1817
                 IF(IVIEW.EQ.1.OR.IVIEW.EQ.3)GO TO 127                  THERMO    1818
                 III=IVA                                                THERMO    1819
                 JJJ=U                                                  THERMO    1820
          127    CONTINUE                                               THERMO    1821
                  INDX=(III-1)*160+JJJ                                  THERMO    1822
                 IF(ICU-NCURV)129,128,128                               THERMO    1823
          128      INDX=10000+IVA                                       THERMO    1824
                 GO TO 1291                                             THERMO    1825
          129     CONTINUE                                              THERMO    1826
```

```
            IPICT(10000+IVA)=MAX0(IPICT(10000+IVA),IPICT(INDX))           THERMO   1827
      1291  CONTINUE                                                      THERMO   1828
            IF(JJ.EQ.NPTS)IND1=INDX                                       THERMO   1829
            IX2=A*SCALV*IVA+B+IDELX                                       THERMO   1830
            IY2=C*SCALW*IPICT(INDX)+D+IDELY                               THERMO   1831
            IF(ICU.EQ.1.OR.ICU.EQ.NCURV)GO TO 170                         THERMO   1832
             IF(MOD(J,IPASS).NE.0)GO TO 170                               THERMO   1833
           NX=IABS(IX2-IXSAV(J))                                          THERMO   1834
            IF(NX.EQ.0)NX=1                                               THERMO   1835
            INCX=1                                                        THERMO   1836
            IF(IXSAV(J).GT.IX2)INCX=-1                                    THERMO   1837
           DX=NX                                                          THERMO   1838
            DY=IY2-IYSAV(J)                                               THERMO   1839
           RATIO=DY/DX                                                    THERMO   1840
            IYST=IYSAV(J)                                                 THERMO   1841
            IX=IXSAV(J)                                                   THERMO   1842
            IN=0                                                          THERMO   1843
            DO 165 I=1,NX                                                 THERMO   1844
            IX=IX+INCX                                                    THERMO   1845
            IY=IYST+I*RATIO                                               THERMO   1846
            IF(IY.LE.MAXY(IX).AND.IY.GE.MINY(IX))GO TO 130                THERMO   1847
           IN=0                                                           THERMO   1848
            GO TO 160                                                     THERMO   1849
       130    IF(IN.EQ.1.OR.I.EQ.1)GO TO 135                              THERMO   1850
            CALL LINEV(IXSAV(J),IYSAV(J),IX,IY)                           THERMO   1851
       135  IXSAV(J)=IX                                                   THERMO   1852
            IYSAV(J)=IY                                                   THERMO   1853
           IN=1                                                           THERMO   1854
       160  CONTINUE                                                      THERMO   1855
           MAXY(IX)=MAX0(IY,MAXY(IX))                                     THERMO   1856
           MINY(IX)=MIN0(IY,MINY(IX))                                     THERMO   1857
       165  CONTINUE                                                      THERMO   1858
           IF(IN.EQ.0)CALL LINEV(IXSAV(J),IYSAV(J),IX2,IY2)               THERMO   1859
       170   IXSAV(J)=IX2                                                 THERMO   1860
           IYSAV(J)=IY2                                                   THERMO   1861
       180  CONTINUE                                                      THERMO   1862
           IX1=A*SCALU*ILEFT+IDELX+B                                      THERMO   1863
           IY1=C*SCALW*IPICT(IND1)+IDELY+D                                THERMO   1864
           IF(IY1.LT.MAXY(IX1).AND.IY1.GT.MINY(IX1)) IOUT = .FALSE.       THERMO   1865
           DO 300 J=2,NPTS                                                THERMO   1866
            IX2=IXSAV(J)                                                  THERMO   1867
           IY2=IYSAV(J)                                                   THERMO   1868
           NX=IABS(IX2-IX1)                                               THERMO   1869
           IF(NX.EQ.0)NX=1                                                THERMO   1870
            INCX=1                                                        THERMO   1871
           IF(IX2.LT.IX1)INCX=-1                                          THERMO   1872
           DX=NX                                                          THERMO   1873
           DY=IY2-IY1                                                     THERMO   1874
           RATIO=DY/DX                                                    THERMO   1875
           IX=IX1                                                         THERMO   1876
            IYST=IY1                                                      THERMO   1877
           DO 230 K=1,NX                                                  THERMO   1878
           IX=IX+INCX                                                     THERMO   1879
           IY=IYST+K*RATIO                                                THERMO   1880
           INDX=IX                                                        THERMO   1881
           MXY=MAXY(INDX)                                                 THERMO   1882
           MNY=MINY(INDX)                                                 THERMO   1883
```

```
          IF(IY.LT.MXY.AND.IY.GT.MNY)GO TO 200                  THERMO  1884
         IOUT=.TRUE.                                            THERMO  1885
         GO TO 220                                              THERMO  1886
  200     CONTINUE                                              THERMO  1887
         IF(.NOT.IOUT) GO TO 210                                THERMO  1888
          CALL LINEV(IX1,IY1,IX,IY)                             THERMO  1889
  210     CONTINUE                                              THERMO  1890
         IOUT=.FALSE.                                           THERMO  1891
         IX1=IX                                                 THERMO  1892
         IY1=IY                                                 THERMO  1893
  220     CONTINUE                                              THERMO  1894
          MAXY(INDX)=MAX0(IY,MXY)                               THERMO  1895
         MINY(INDX)=MIN0(IY,MNY)                                THERMO  1896
  230    CONTINUE                                               THERMO  1897
          IF(.NOT.IOUT)GO TO 234                                THERMO  1898
         CALL LINEV(IX1,IY1,IX2,IY2)                            THERMO  1899
  234    CONTINUE                                               THERMO  1900
         IND1=IX1                                               THERMO  1901
          MAXY(IND1)=MAX0(IY1,MAXY(IND1))                       THERMO  1902
         MINY(IND1)=MIN0(IY1,MINY(IND1))                        THERMO  1903
         IX1=IX2                                                THERMO  1904
         IY1=IY2                                                THERMO  1905
  300    CONTINUE                                               THERMO  1906
  700     CONTINUE                                              THERMO  1907
         RETURN                                                 THERMO  1908
         END                                                    THERMO  1909
```

```
        SUBROUTINE PLT3D       74/74   OPT=1   TRACE                FTN 4.2+74355      09/29/76  13.01.14.       PAGE     6

        SYMBOLIC REFERENCE MAP (R=1)

 ENTRY POINTS
     1  PLT3D

 VARIABLES      SN  TYPE            RELOCATION
  1057  A           REAL                             1061  B         REAL
  1060  C           REAL                             1062  D         REAL
  1010  DELU        REAL                             1001  DIFX      REAL
  1011  DX          REAL                             1013  DY        REAL
  1023  I           INTEGER                             7  IAFTER    INTEGER    ARRAY    / /
     1  IBACK       INTEGER            PLIM             0  IBEFOR    INTEGER    ARRAY    / /
  1030  ICU         INTEGER                          1012  IDELX     INTEGER
  1014  IDELY       INTEGER                             0  IFOR      INTEGER             PLIM
  1035  III         INTEGER                             2  ILEFT     INTEGER             PLIM
  1046  IN          INTEGER                          1042  INCX      INTEGER
  1051  INDX        INTEGER                          1026  INDX1     INTEGER
  1027  INDX2       INTEGER                          1054  IND1      INTEGER
   771  IOUT        LOGICAL                             5  IPASS     INTEGER             PLIM
    17  IPICT       INTEGER   ARRAY    / /              3  IRIGHT    INTEGER             PLIM
    16  ITOP        INTEGER            / /             12  IU        INTEGER    ARRAY    MAXVAL
    16  IV          INTEGER   ARRAY    MAXVAL        1034  IVA       INTEGER
     4  IVIEW       INTEGER            PLIM            22  IW        INTEGER    ARRAY    MAXVAL
  1037  IWDX        INTEGER                          1040  IWD1      INTEGER
  1045  IX          INTEGER                          1067  IXSAV     INTEGER    ARRAY
  1015  IX1         INTEGER                          1017  IX2       INTEGER
  1047  IY          INTEGER                          1257  IYSAV     INTEGER    ARRAY
  1044  IYST        INTEGER                          1016  IY1       INTEGER
  1020  IY2         INTEGER                          1032  J         INTEGER
  1033  JJ          INTEGER                          1036  JJJ       INTEGER
  1050  K           INTEGER                          3447  MAXY      INTEGER    ARRAY
  1447  MINY        INTEGER   ARRAY                  1053  MNY       INTEGER
  1052  MXY         INTEGER                          1024  NCURV     INTEGER
  1025  NPTS        INTEGER                          1041  NX        INTEGER
  1055  R           REAL      ARRAY                  1043  RATIO     REAL
   776  SCALU       REAL                              777  SCALV     REAL
  1000  SCALW       REAL                              775  SCMIN     REAL
     6  THETA       REAL               MAXVAL        1031  U         REAL
     7  UAXIS       REAL               MAXVAL           1  UBACK     REAL                MAXVAL
     0  UFOR        REAL               MAXVAL         772  ULNTH     REAL
    11  UVPLNE      REAL               MAXVAL          10  VAXIS     REAL                MAXVAL
     2  VLEFT       REAL               MAXVAL         773  VLNTH     REAL
     3  VRIGHT      REAL               MAXVAL           4  WBOT      REAL                MAXVAL
   774  WLNTH       REAL                                5  WTOP      REAL                MAXVAL
  1003  XLEFT       REAL                             1002  XRIGHT    REAL
  1007  XSCALE      REAL                             1022  X2        REAL
  1005  YBOT        REAL                             1006  YSCALE    REAL
  1004  YTOP        REAL                             1021  Y2        REAL

 EXTERNALS          TYPE    ARGS
       ABS          REAL      1                            AMIN1     REAL       3
       COS          REAL      1                            FRAMEV               1
       IABS         INTEGER   1                            ISIGN     INTEGER    2
       LINEV                  4                            MAX0      INTEGER    2
       MIN0         INTEGER   2                            MOD       INTEGER    2
       NXV          INTEGER   1                            NYV       INTEGER    1
       SCLSAV                 1                            SIN       REAL       1
```

```
SUBROUTINE PLT3D      74/74    OPT=1    TRACE                    FTN 4.2+74355       09/29/76   13.01.14.       PAGE      7

  EXTERNALS           TYPE   ARGS
        XSCALV                4                             YSCALV              4

  STATEMENT LABELS
     35   19                              53   20                                 60   30
    251   60                               0   61          INACTIVE              382   62
    306   63                               0  100          INACTIVE                0  110          INACTIVE
    337  120                             341  129                                399  127
      0  128        INACTIVE             365  129                                464  130
    475  135                             501  160                                  0  165
    521  170                               0  180                                614  200
    617  210                             623  220                                  0  230
    637  234                               0  300                                  0  700
    379 1291

  COMMON BLOCKS   LENGTH
        / /        10115
        MAXVAL        22
        PLIM           6

  STATISTICS
    PROGRAM LENGTH               54479    2655
    CM LABELED COMMON LENGTH       34B      28
    CM BLANK COMMON LENGTH      23603B   10115


SUBROUTINE CLASS      74/74    OPT=1    TRACE                    FTN 4.2+74355       09/29/76   13.01.24.       PAGE      1

                SUBROUTINE CLASS(ITITL)                                            THERMO  1910
          C**** THIS SUBROUTINE WRITES CLASSIFICATION AT TOP OF PICTIRE AND TITLE  THERMO  1911
          C   IF REQUESTED.                                                        THERMO  1912
                 COMMON/CLASF/ICLASS,TITLE(8)                                      THERMO  1913
                 EXTERNAL TABL1V                                                   THERMO  1914
                CALL CHSIZV(3,3)                                                   THERMO  1915
                CALL RITSTV(10,26,TABL1V)                                          THERMO  1916
                IF(ICLASS-1)80,20,30                                               THERMO  1917
          20     CALL RITE2V(412,1009,1023,90,2,12,-1,12HCONFIDENTIAL ,NE)         THERMO  1918
                 CALL RITE2V(412,  20,1023,90,2,12,-1,12HCONFIDENTIAL ,NE)         THERMO  1919
                GO TO 80                                                           THERMO  1920
          30    CALL RITE2V(440,1009,1023,90,2,6,-1,6HSECRET ,NE)                  THERMO  1921
                CALL RITE2V(440,  20,1023,90,2,6,-1,6HSECRET ,NE)                  THERMO  1922
          80    CONTINUE                                                           THERMO  1923
                CALL CHSIZV(2,2)                                                   THERMO  1924
                CALL RITSTV(13,19,TABL1V)                                          THERMO  1925
                 IF(ITITL.EQ.0)GO TO 90                                            THERMO  1926
                 CALL RITE2V(30,987,1023,90,2,70,1,TITLE,NE)                       THERMO  1927
          90     CONTINUE                                                          THERMO  1928
                 RETURN                                                            THERMO  1929
                 END                                                               THERMO  1930
```

```
SUBROUTINE CLASS        74/74    CPT=1    TRACE                       FTN 4.2+74355        09/29/76  13.01.24.        PAGE     2

        SYMBOLIC REFERENCE MAP (R=1)

    ENTRY POINTS
        3  CLASS

    VARIABLES        SN   TYPE              RELOCATION
        0  ICLASS         INTEGER                CLASF              0  ITITL      INTEGER                    F.P.
      163  NE             INTEGER                                   1  TITLE      REAL           ARRAY       CLASF

    EXTERNALS              TYPE    ARGS
           CMSIZV                    2                                 RITE2V                      9
           RITSTV                    3                                 TABL1V                      0

    STATEMENT LABELS
        0  20              INACTIVE            22   30                                                 30   80
       37  90

    COMMON BLOCKS      LENGTH
           CLASF            9

    STATISTICS
      PROGRAM LENGTH                   176B         126
      CM LABELED COMMON LENGTH          11B           9
```

```
      SUBROUTINE PACKED                                         THERMO  1931
C**** THIS SUBROUTINE READS A PACKED TAPE CONTAINING ONLY THE    THERMO  1932
C   VALID DATA DURING PASS TIMES                                THERMO  1933
      COMMON IBEFOR(7),IAFTER(7),ITOP,IPICT(10100)              THERMO  1934
       COMMON/POPFT/NNS,NSR,ONE,IEND,JSTOP,START,STOP,ICKSTR,ICKSTP, THERMO  1935
     . IVALID,ICALIB,INPT                                       THERMO  1936
                                                                THERMO  1937
      EQUIVALENCE (IBEFCR(1),TIM1),(IAFTER(1),TIM2)             THERMO  1938
 101  CONTINUE                                                  THERMO  1939
       READ(11)IBEFOR,IAFTER,INPT,(IPICT(K),K=1,2000)           THERMO  1940
      IF(EOF(11))999,998,999                                    THERMO  1941
  998 IF(IOCHEC(11))101,997,101                                 THERMO  1942
  997 CONTINUE                                                  THERMO  1943
       IEND=0                                                   THERMO  1944
       TT1=TIM1-START                                           THERMO  1945
       TT2=ABS(TIM1-STOF)                                       THERMO  1946
      IF(TT1.GT.0)ICKSTR=0                                      THERMO  1947
      IF(TT2.LT.10000.)ICKSTP=1                                 THERMO  1948
       IF(ICKSTP)112,112,111                                    THERMO  1949
   111  CONTINUE                                                THERMO  1950
       TT3=ABS(TIM2-TIM1)                                       THERMO  1951
      IF(TT3.GT.10000.)GO TO 112                                THERMO  1952
      IF(TIM1.GT.STOP)GC TO 990                                 THERMO  1953
 112  CONTINUE                                                  THERMO  1954
      JSTOP=0                                                   THERMO  1955
      IF(ICKSTR)114,114,113                                     THERMO  1956
 113  CONTINUE                                                  THERMO  1957
      IF(TIM1.LT.START)GO   TO 101                              THERMO  1958
 114  CONTINUE                                                  THERMO  1959
       :                                                        THERMO  1960
C**** THIS PICTURE IS WITHIN START STOP TIMES                    THERMO  1961
C    CHECK IF CALIBRATE ONLY WAS REQUESTED                       THERMO  1962
      ICAL=IBEFOR(5)                                            THERMO  1963
      IF(ICALIB.EQ.1.ANC.ICAL.EQ.0)GO TO 101                    THERMO  1964
                                                                THERMO  1965
      II=10000                                                  THERMO  1966
      JJ=2000                                                   THERMO  1967
      DO 200 J=1,2000                                           THERMO  1968
      IPICT(II)=IPICT(JJ).AND.7777B                             THERMO  1969
      IPICT(II-1)=SHIFT(IPICT(JJ),-12).AND.7777B                THERMO  1970
      IPICT(II-2)=SHIFT(IPICT(JJ),-24).AND.7777B                THERMO  1971
      IPICT(II-3)=SHIFT(IPICT(JJ),-36).AND.7777B                THERMO  1972
      IPICT(II-4)=SHIFT(IPICT(JJ),-48).AND.7777B                THERMO  1973
      II=II-5                                                   THERMO  1974
      JJ=JJ-1                                                   THERMO  1975
 200   CONTINUE                                                 THERMO  1976
       DO 205 J=1,10100                                         THERMO  1977
      IF(J.GT.10000)IPICT(J)=0                                  THERMO  1978
      IF(IPICT(J).GT.1024)IPICT(J)=-1                           THERMO  1979
 205  CONTINUE                                                  THERMO  1980
 800  CONTINUE                                                  THERMO  1981
       RETURN                                                   THERMO  1982
 990   CONTINUE                                                 THERMO  1983
      JSTOP=1                                                   THERMO  1984
      ICKSTP=0                                                  THERMO  1985
      BACKSPACE 11                                              THERMO  1986
      BACKSPACE 11                                              THERMO  1987
```

```
      SUBROUTINE PACKED     74/74    OPT=1    TRACE                FTN 4.2+74355       09/29/76  13.01.26.       PAGE     2

                      BACKSPACE 11                                                         THERMO   1988
                      BACKSPACE 11                                                         THERMO   1989
   60                  GO TO 800                                                           THERMO   1990
                999      IEND=IEND+1                                                       THERMO   1991
                       IF(IEND.GT.2)GO TO 800                                              THERMO   1992
                       GO TO 101                                                           THERMO   1993
                       END                                                                 THERMO   1994


      SUBROUTINE PACKED     74/74    OPT=1    TRACE                FTN 4.2+74355       09/29/76  13.01.26.       PAGE     3

      SYMBOLIC REFERENCE MAP (R=1)

 ENTRY POINTS
     1   PACKED

 VARIABLES      SN  TYPE         RELOCATION
     7   IAFTER     INTEGER     ARRAY  / /              0   IBEFOR    INTEGER     ARRAY    / /
   173   ICAL       INTEGER                            12   ICALIB    INTEGER              PDPFT
    10   ICKSTP     INTEGER            PDPFT            7   ICKSTR    INTEGER              PDPFT
     3   IEND       INTEGER            PDPFT          174   II        INTEGER
    13   INPT       INTEGER            PDPFT           17   IPICT     INTEGER     ARRAY    / /
    16   ITOP       INTEGER            / /             11   IVALID    INTEGER              PDPFT
   176   J          INTEGER                           175   JJ        INTEGER
     4   JSTOP      INTEGER            PDPFT          167   K         INTEGER
     1   NSR        INTEGER            PDPFT            0   NWS       INTEGER              PDPFT
     2   ONE        REAL               PDPFT            5   START     REAL                 PDPFT
     6   STOP       REAL               PDPFT            0   TIM1      REAL                 / /
     7   TIM2       REAL               / /            170   TT1       REAL
   171   TT2        REAL                              172   TT3       REAL

 FILE NAMES         MODE
       TAPE11       UNFMT

 EXTERNALS            TYPE    ARGS
       ABS          REAL        1                           EOF       REAL       1
       IOCHEC       INTEGER     1                           SHIFT     NO TYPE    2

 STATEMENT LABELS
     2   101                              0   111       INACTIVE               36   112
     0   113          INACTIVE           42   114                               0   200
     0   205                            125   800                             126   990
     0   997          INACTIVE            0   998       INACTIVE              141   999

 COMMON BLOCKS     LENGTH
       / /          10115
       PDPFT           12

 STATISTICS
   PROGRAM LENGTH                 177B     127
   CM LABELED COMMON LENGTH        14B      12
   CM BLANK COMMON LENGTH       23603B   10115
```

```
SUBROUTINE UNPACK      74/74    OPT=1    TRACE                   FTN 4.2+74355        09/29/76  13.07.29.        PAGE     1

      SUBROUTINE UNPACK(IN,MTAB,MOUT)                                   SEPT12     4
      DIMENSION IN(1),MTAB(1),MOUT(1),MASK(60)                          SEPT12     5
      CALL GETMSK(MASK)                                                 SEPT12     6
      I=0                                                               SEPT12     7
      M=0                                                               SEPT12     8
      MWORD=1                                                           SEPT12     9
      MBIT=60                                                           SEPT12    10
   10 I=I+1                                                             SEPT12    11
      KTAB=MTAB(I)                                                      SEPT12    12
      IF(KTAB)20,90,40                                                  SEPT12    13
   20 MBIT=MBIT+KTAB                                                    SEPT12    14
   25 IF(MBIT)30,70,10                                                  SEPT12    15
   30 MBIT=60+MBIT                                                      SEPT12    16
      MWORD=MWORD+1                                                     SEPT12    17
      GO TO 25                                                          SEPT12    18
   40 M=M+1                                                             SEPT12    19
      MDIF=MBIT-KTAB                                                    SEPT12    20
      IF(MDIF)50,60,80                                                  SEPT12    21
   50 IWORD=SHIFT(AND(IN(MWORD),MASK(MBIT)),-MDIF)                      SEPT12    22
      MWORD=MWORD+1                                                     SEPT12    23
      MBIT=60+MDIF                                                      SEPT12    24
      MOUT(M)=OR(IWORD,AND(SHIFT(IN(MWORD),-MBIT),MASK(-MDIF)))         SEPT12    25
      GO TO 10                                                          SEPT12    26
   60 MOUT(M)=AND(IN(MWORD),MASK(KTAB))                                 SEPT12    27
   70 MBIT=60                                                           SEPT12    28
      MWORD=MWORD+1                                                     SEPT12    29
      GO TO 10                                                          SEPT12    30
   80 MBIT=MDIF                                                         SEPT12    31
      MOUT(M)=AND(SHIFT(IN(MWORD),-MDIF),MASK(KTAB))                    SEPT12    32
      GO TO 10                                                          SEPT12    33
   90 RETURN                                                            SEPT12    34
      END                                                               SEPT12    35
```

```
      SUBROUTINE UNPACK     74/74    OPT=1    TRACE                 FTN 4.2+74355       09/29/76  13.07.29.       PAGE    2

      SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS
   3  UNPACK

VARIABLES      SN  TYPE             RELOCATION
  140  I           INTEGER                              0  IN          INTEGER    ARRAY     F.P.
  146  IWORD       INTEGER                            144  KTAB        INTEGER
  141  M           INTEGER                            147  MASK        INTEGER    ARRAY
  143  MBIT        INTEGER                            145  MDIF        INTEGER
    0  MOUT        INTEGER    ARRAY     F.P.            0  MTAB        INTEGER    ARRAY     F.P.
  142  MWORD       INTEGER

EXTERNALS          TYPE   ARGS
      AND        NO TYPE   2                            GETMSK                 1
      OR         NO TYPE   2                            SHIFT       NO TYPE    2

STATEMENT LABELS
   13  10                          0  20       INACTIVE              21  29
    0  30       INACTIVE          26  40                              0  50       INACTIVE
   64  60                         73  70                             76  80
  113  90

STATISTICS
  PROGRAM LENGTH         243B     163

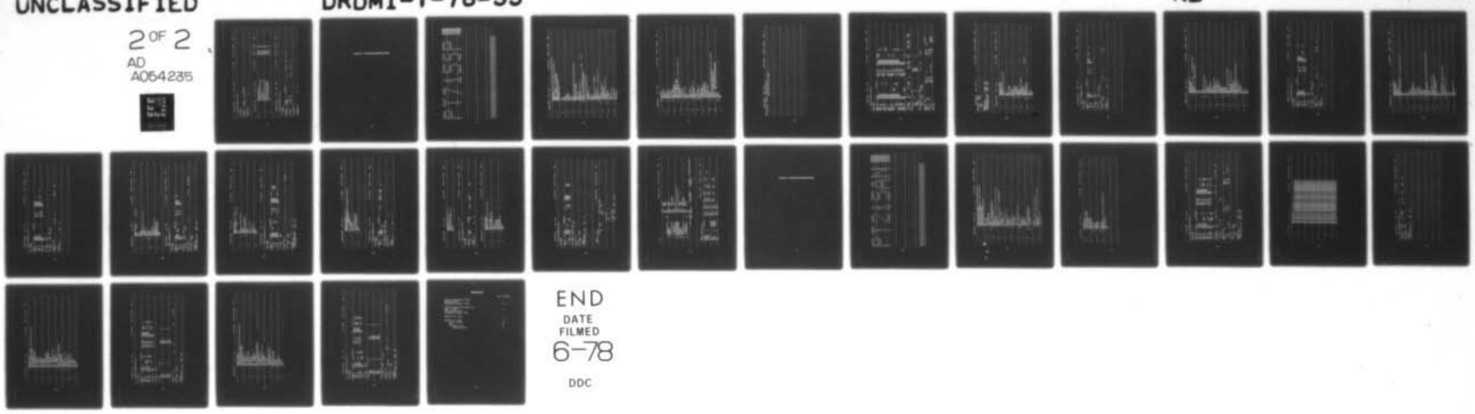
      SUBROUTINE DONE       74/74    OPT=1    TRACE                 FTN 4.2+74355       09/29/76  13.08.54.       PAGE    1

                     SUBROUTINE DONE(IT)                                          SEPT12       36
            C        SUBROUTINE TO DISMOUNT TAPE IT, AND MOUNT NEXT TAPE.         SEPT12       37
                     PAUSE " MOUNT NEXT TAPE "                                    SEPT12       38
                     RETURN                                                       SEPT12       39
      5              END                                                          SEPT12       40
```

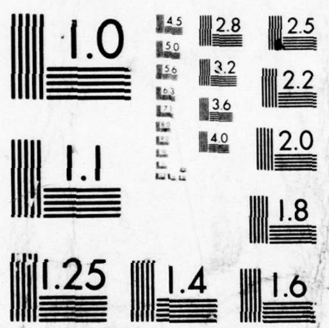
AD-A054 235 ARMY MISSILE RESEARCH AND DEVELOPMENT COMMAND REDSTO--ETC F/G 17/5
COMPUTER SOFTWARE FOR ANALYSIS OF INFRARED TARGETS AND CLUTTER.(U)
JAN 78 G E GOWINS, H T JACKSON

UNCLASSIFIED DRDMI-T-78-33 NL

2 OF 2
AD
A054235



END
DATE
FILMED
6-78
DDC



MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

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      SUBROUTINE DONE        74/74    OPT=1    TRACE                    FTN 4.2+74355        09/29/76  13.08.54.        PAGE      2

      SYMBOLIC REFERENCE MAP (R=1)

 ENTRY POINTS
     3  DONE

 VARIABLES        SN  TYPE              RELOCATION
     0  IT            INTEGER   *UNUSED     F.P.

 STATISTICS
   PROGRAM LENGTH                   13B        11


      SUBROUTINE GETMSK      74/74    OPT=1    TRACE                    FTN 4.2+74355        09/29/75  13.08.55.        PAGE      1

                          SUBROUTINE GETMSK(IM)                                                          SEPT12     41
                          DIMENSION IM(60)                                                               SEPT12     42
                          DATA MASK/00000000000000000001B/                                               SEPT12     43
                          IM(1)=MASK                                                                     SEPT12     44
                          DO 10 I=2,57                                                                   SEPT12     45
                          IM(I)=OR(SHIFT(IM(I-1),1),MASK)                                                SEPT12     46
                       10 CONTINUE                                                                       SEPT12     47
                          IM(58)=17777777777777777777B                                                   SEPT12     48
                          IM(59)=37777777777777777777B                                                   SEPT12     49
                          IM(60)=77777777777777777777B                                                   SEPT12     50
                          END                                                                            SEPT12     51


      SUBROUTINE GETMSK      74/74    OPT=1    TRACE                    FTN 4.2+74355        09/29/76  13.08.55.        PAGE      2

      SYMBOLIC REFERENCE MAP (R=1)

 ENTRY POINTS
     3  GETMSK

 VARIABLES        SN  TYPE              RELOCATION
    41  I             INTEGER                                  0  IM          INTEGER     ARRAY     F.P.
    35  MASK          INTEGER

 EXTERNALS            TYPE    ARGS
       OR             NO TYPE    2                                SHIFT       NO TYPE     2

 STATEMENT LABELS
     0  10

 STATISTICS
   PROGRAM LENGTH                   42B        34
```

Appendix B. LISTING FOR PROGRAM GOWEN

PT71SSP
PT71SSP
PT71SSP
PT71SSP
PT71SSP
PT71SSP
PT71SSP
PT71SSP
PT71SSP
PT71SSP
PT71SSP
PT71SSP

```
      PROGRAM GOWEN(INPUT,OUTPUT,TAPE5=INPUT,TAPE6=OUTPUT,TAPE1,TAPE7,
     1TAPE2,TAPE3)
      DIMENSION X(50),Y(50),VIEW(4),KR(50,4),KC(50,4),KW(50,4)
      COMMON    M(10000),          IA(7),IB(7)
      COMMON/MVAL/MINVAL,MAXVAL,MINV,MAXV,NWDS
      COMMON/BLOCK/ ICL,IZ,IB1,INC,IT.
      EQUIVALENCE(T1,IB(1))
C
      IF=0
      ICL=4
      INC=2
      IZ=100
      IB1=IZ+1
      ITL=10000
      MAXVAL=1200
      MINVAL=1
      KK=0
      T1=0.0
      NDEL=50
    1 READ(5,7) IFIL,IAP,IGN, KH,KM ,SECK,RANGE,(VIEW(I),I=1,4)
    7 FORMAT(5I3,2F10.3,4A10)
      IF(IFIL.LT.0) GO TO 1001
      IF=IF+1
      WRITE(6, 17)IF
   17 FORMAT(1H1,10X,*FRAME =*,I4)
      WRITE(6, 10)
   10 FORMAT(      1X*FIL  APER GAIN  H     M   S             RANGE       VIEW*)
      WRITE(6, 11) IFIL,IAP,IGN,KH, KM, SECK,RANGE,VIEW
   11 FORMAT(1XI2,1X4I5,F7.3, 2XF10.2,2X4A10)
C
      TM=FLOAT(KH)*3600+FLOAT(KM)*60+SECK
      TM=TM*1000.0
      IF(TM.GT.T1) GO TO 3
      REWIND 1
      KK=0
    3 CONTINUE
      KK=KK+1
      READ(1) IB,IA,MM, (M(J), J=1,1000),5)
      IF(EOF(1))4,6
    4 WRITE(6,5)      KK
    5 FORMAT(1X*TIME * I3, *-----END-OF-FILE-----*)
      STOP01
    6 CONTINUE
      CALL IHMS(T1,IH,IM, SEC)
      IF(IH.NE.KH) GO TO 3
      IF(IM.NE.KM) GO TO 3
      IF(ABS(SECK-SEC).GT.0.05) GO TO 3
   88 CONTINUE
      CALL UNPACK(M)
C     GO TO 999
      CALL MEAN
      IBM=10
      CALL ATTACK(M,IBM)
      N=4
      CALL RADAR2(M,N)
      GO TO 1
      CALL VSCAN(M)
```

```
      CALL RAJAR
  999 CONTINUE
      CALL ELIM(M,K)
      REWIND 2
      WRITE(3) DUM
      REWIND 3
      DO 63 I=1,K
   63 WRITE(2) M(I)
      CALL SORTP
      DO 64 I=1,K
   64 READ(3) M(I)
      MAXV=M(1).AND.77778
      MINV=M(K).AND.77778
      DELTA=FLOAT(MAXV-MINV)/50.)
      WRITE(6,12) MINV,MAXV,DELTA
   12 FORMAT(/1X*MINV=*I4,* MAXV=*I4,* DELTA=*F5.1,//8X*X*,9X*Y*)
      TEST=FLOAT(MAXV)-DELTA
      X(1)=0.5*DELTA
      Y(1)=0.0
      DO 70 I=2,NDEL
      Y(I)=0.0
   70 X(I)=X(I-1)+DELTA
      J=NDEL
      KGO=1
      KJ=0
      DO 73 I=1,K
      MI=M(I).AND.77778
      VMI=MI
   71 IF(VMI.GE.TEST) GO TO 72
      TEST=TEST-DELTA
      J=J-1
      GO TO 71
   72 Y(J)=Y(J)+1.0
      GO TO (91,95),KGO
   91 KJ=KJ+1
      JJ=(KJ-1)/50+1
      II=KJ-50*(JJ-1)
      KLT=SHIFT(M(I),-12)
      KC(II,JJ)=KLT.AND.7778
      KR(II,JJ)=SHIFT(KLT,-9)
      KV(II,JJ)=MI
      IF(KJ.EQ.200) KGO=2
   95 CONTINUE
   73 CONTINUE
      WRITE(6,74) ((X(I),Y(I),(KR(I,J),KC(I,J),KV(I,J),J=1,4),I=1,NDEL))
   74 FORMAT(1X2F10.2,4X3I6,4X3I6,4X3I6,4X3I6)
      WRITE(7)    KH,KM,SIGK,(VI2(I),I=1,4)
      WRITE(7)      ((X(I),Y(I),I=1,50)),IFIL,IAP,IGN,RANGE
      WRITE(7)    ((KR(I,J),KC(I,J),KV(I,J),I=1,50),J=1,4)
      GO TO 1
 1001 CONTINUE
      STOP
      END
```

PROGRAM GOWEN   74/74   OPT=1   FTN 4.2+74355   01/31/77 11.46.08.   PAGE   3

CARD NR.	SEVERITY	DETAILS	DIAGNOSIS OF PROBLEM
57	I		THERE IS NO PATH TO THIS STATEMENT.

```
PROGRAM GOWEN       74/74   OPT=1                              FTN 4.2+74355        01/31/77  11.46.08.      PAGE     4

        SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS
 14320   GOWEN

VARIABLES       SN  TYPE            RELOCATION
 15072   DELTA       REAL                              15071   DUM        REAL        *UNDEF*
 15057   I           INTEGER                           23421   IA         INTEGER     ARRAY       / /
 15051   IAP         INTEGER                           23427   IB         INTEGER     ARRAY       / /
 15066   IBM         INTEGER                               2   IBI        INTEGER                 BLOCK
     0   ICL         INTEGER            BLOCK          15043   IF         INTEGER
 15050   IFIL        INTEGER                           15052   IGN        INTEGER
 15063   IH          INTEGER                           15101   II         INTEGER
 15064   IN          INTEGER                               3   INC        INTEGER                 BLOCK
     4   ITL         INTEGER            BLOCK              1   IZ         INTEGER                 BLOCK
 15062   J           INTEGER                           15103   JJ         INTEGER
 15070   K           INTEGER                           15563   KC         INTEGER     ARRAY
 15074   KGO         INTEGER                           15053   KH         INTEGER
 15075   KJ          INTEGER                           15046   KK         INTEGER
 15102   KLT         INTEGER                           15054   KM         INTEGER
 15253   KR          INTEGER    ARRAY                  15073   KV         INTEGER     ARRAY
     0   M           INTEGER    ARRAY   / /                3   MAXV       INTEGER                 MVAL
     1   MAXVAL      INTEGER            MVAL           15075   MI         INTEGER
     2   MINV        INTEGER            MVAL               3   MINVAL     INTEGER                 MVAL
 15061   MN          INTEGER                           15067   N          INTEGER
 15047   MDEL        INTEGER                               4   NMDS       INTEGER                 MVAL
 15056   RANGE       REAL                              15065   SEC        REAL
 15055   SECK        REAL                              15073   TEST       REAL
 15060   TN          REAL                              23427   T1         REAL                    / /
 15247   VIEW        REAL       ARRAY                  15077   VMI        REAL
 15103   X           REAL       ARRAY                  15105   Y          REAL        ARRAY

FILE NAMES          MODE
     0   INPUT                      2041   OUTPUT                   4102   TAPE1      UNFMT        10206   TAPE2     UNFMT
 12249   TAPE3      UNFMT              0   TAPE5      FMT           2041   TAPE6      FMT           6143   TAPE7     UNFMT

EXTERNALS           TYPE   ARGS
         ATTACK               2                                    ELIM               2
         EOF        REAL      1                                    IHMS               4
         MEAN                 0                                    RADAR              0
         RADAR2               2                                    SORTF              3
         UNPACK               1                                    VSCAN              1

INLINE FUNCTIONS    TYPE   ARGS
         ABS        REAL      1   INTRIN                           FLOAT      REAL    1   INTRIN
         SHIFT      NO TYPE   2   INTRIN

STATEMENT LABELS
 14333   1                               14301   3                                       0   4                  INACTIVE
 14741   5          FMT                  14402   6                                   14656   7          FMT
 14674   10         FMT                  14716   11      FMT                         14770   12         FMT
 14665   17         FMT                      0   63                                      0   54
     0   70                              14516   71                                  14523   72
     0   73                              15000   74      FMT   NO REFS                   0   80                 INACTIVE
 14533   91                              14554   99                                      0   999                INACTIVE
 14616   1001
```

```
      PROGRAM GOMEN        74/74    OPT=1                         FTN 4.2+74355     01/31/77  11.46.08.        PAGE     5

 COMMON BLOCKS    LENGTH
        / /        10014
        NVAL           5
        BLOCK          5

 STATISTICS
   PROGRAM LENGTH               20770      1087
   BUFFER LENGTH               143060      6362
   CM LABELED COMMON LENGTH       120        10
   CM BLANK COMMON LENGTH      234360     10014


      SUBROUTINE VSCAN      74/74    OPT=1                        FTN 4.2+74355     01/31/77  11.46.04.        PAGE     1

            SUBROUTINE VSCAN(N)
            DIMENSION N(100,103)
            WRITE(6,5)
      5     FORMAT(1X,7HAVERAGE,10HSTD DEVIAT)
            I=0
            J=0
            TI=0
            SX=0
            DO 10 K=1,100
            DO 10 J=1,100
            I=I+1
            N(K,J)=N(I)
     10     CONTINUE
            DO 20 J=1,100
            DO 30 K=1,100
            TI=TI+N(K,J)
            SX=SX+N(K,J)**2
     30     CONTINUE
            XB=TI/100
            SVX=(100*SX-TI**2)/(100*99)
            SDX=SQRT(SVX)
            WRITE(5,21) J
     21     FORMAT(1X,*                                        COLUN*,I4)
            WRITE(5,22) XB,SDX
     22     FORMAT(1X,2F10.2)
            TI=0
            SX=0
     20     CONTINUE
            RETURN
            END
```

```
        SUBROUTINE VSCAN     74/74   OPT=1                          FTN 4.2+74355      01/31/77  11.46.04.      PAGE     2

        SYMBOLIC REFERENCE MAP (R=1)

  ENTRY POINTS
      3  VSCAN

  VARIABLES       SN  TYPE            RELOCATION
     116  I           INTEGER                           117  J              INTEGER
     122  K           INTEGER                             0  M              INTEGER      ARRAY      F.P.
     125  SDX         REAL                              124  SVX            REAL
     121  SX          REAL                              120  TI             REAL
     123  XB          REAL

  FILE NAMES          MODE
         TAPE6        FMT

  EXTERNALS            TYPE   ARGS
         SQRT         REAL      1 LIBRARY

  STATEMENT LABELS
     67  5         FMT                    0  10                                        0  20
     77  21        FMT                  112  22          FMT                           0  30

  STATISTICS
    PROGRAM LENGTH              1343     32
```

```
SUBROUTINE ATTACK      74/74    OPT=1                     FTN 4.2+74355        01/31/77  11.46.05.       PAGE     1

      SUBROUTINE ATTACK(N,IBN)
      DIMENSION N(10000)
      WRITE(6,5) IBN
    5 FORMAT(10X,*FLY IN MODEL      CELL INCREMENTED BY*,I4,/)
      WRITE(6,7)
    7 FORMAT(1X,*    MEAN    STANDARD DEVIATION*)
      IN=0
      TI=0
      N=100
      K1=1
      SX=0
      I=0
      ICL=0
C     PROCESS FIRST COMPLETE ROW
   10 I=I+1
C     IF(N(I).EQ.0) IN=IN+1
      ICL=ICL+1
      TI=TI+N(I)
      SX=SX+N(I)**2
      IF(I.LT.N)GO TO 10
      J2=I+100
      J1=J2-N+1
C     PROCESS FROM ROW(2-100))
   11 DO 30 II=K1,N
      IF(II.EQ.1)GO TO 30
      DO 20 J=J1,J2
C     IF(N(J).EQ.0)IN=IN+1
      TI=TI+N(J)
      SX=SX+N(J)**2
      ICL=ICL+1
   20 CONTINUE
      J1=J1+100
      J2=J2+100
   30 CONTINUE
C     WRITE MEAN(XB),STANDARD DEVIATION(SDX)
      IN=0
      XB=TI/(ICL-IN)
      SVX=(ICL*SX-TI**2)/(ICL*(ICL-1))
      SDX=SQRT(SVX)
      WRITE(6,25) XB,SDX
   25 FORMAT(1X,2F10.2,/)
C     CREATE SMALLER FRAME,COLUMN(K1-N) ROW(J1-J2)
      N=N-IBN
      IF(N.LE.50)RETURN
      K1=100-N
      J1=K1*100+K1+1
      J2=K1*100+N
      TI=0
      SX=0
      ICL=0
      IN=0
      GO TO 11
      END
```

```
SUBROUTINE ATTACK      74/74    OPT=1                          FTN 4.2+74355        01/31/77  11.46.05.       PAGE     2

   SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS
   3   ATTACK

VARIABLES        SN  TYPE         RELOCATION
   151  I            INTEGER                          0  I3M     INTEGER                F.P.
   152  ICL          INTEGER                        155  II      INTEGER
   144  IN           INTEGER                        155  J       INTEGER
   154  J1           INTEGER                        153  J2      INTEGER
   147  KI           INTEGER                          0  M       INTEGER      ARRAY     F.P.
   146  N            INTEGER                        161  SDX     REAL
   160  SVX          REAL                           151  SX      REAL
   145  TI           REAL                           157  XB      REAL

FILE NAMES         MODE
      TAPE6        FMT

EXTERNALS          TYPE   ARGS
      SQRT         REAL      1 LIBRARY

STATEMENT LABELS
   115  3          FMT                   127   7       FMT                    26  10
    42  11                                 0  20                             141  25          FMT
    62  30

STATISTICS
  PROGRAM LENGTH              167B     119
```

SUBROUTINE RADAR2   74/74   OPT=1   FTN 4.2+74355   01/31/77 11.46.08.   PAGE   1

```
      SUBROUTINE RADAR2(M,N)
      DIMENSION M(10000)
C     PROCESSING FIRST ROW
      WRITE(6,24)
      WRITE(6,27)
   24 FORMAT(10X,*RADAR SCAN*,/)
   27 FORMAT(5X,*RLUTN CNJN GNUM  TOT. DEN  MEAN VAL  STD DEV*,/)
      NN=100
      I=0
      TI=0
      SX=0
      JJ=0
      IC=0
   10 I=I+1
      IC=IC+1
      TI=TI+M(I)
      SX=SX+M(I)**2
      IF(IC.LT.N)GO TO 10
C     PROCESS OTHER ROWS
      J2=I+100
      J1=J2-N+1
      DO 30 II=2,N
      DO 20 J=J1,J2
      TI=TI+M(J)
      SX=SX+M(J)**2
   20 CONTINUE
      J1=J1+100
      J2=J2+100
   30 CONTINUE
C     SCAN NUMBER(JJ),NUMBER CEL. PER SCAN(ICL),TOTAL CELL DENSITY(TI)
C     MEAN CELL VALUE(XB)
      JJ=JJ+1
      ICL=N**2
      XB=TI/ICL
      SVX=(ICL*SX-TI**2)/(ICL*(ICL-1))
      SDX=SQRT(SVX)
      WRITE(6,25) N,JJ,ICL,TI,XB,SDX
   25 FORMAT(2X,,3I5,2X,3F10.2)
C     CONTINUE ON FIRST ROW
      IN=0
      TI=0
      SX=0
      IC=0
      IF(I.LT.NN)GO TO 10
C     FIRST ROW COMPLETED DETERMINE NEW FIRST ROW
      WRITE(6,26)
   26 FORMAT(10X,*PASS  COMPLETED   *)
      I=J2-100
      NN=J2
      IC=0
      IN=0
      TI=0
      SX=0
      IF(NN.LT.10000)GO TO 10
      RETURN
      END
```

```
      SUBROUTINE RADAR2      74/74    OPT=1                        FTN 4.2+74355       01/31/77  11.46.08.       PAGE     2

      SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS
    3  RADAR2

VARIABLES        SN  TYPE          RELOCATION
  157  I             INTEGER                               163  IC        INTEGER
  170  ICL           INTEGER                               165  II        INTEGER
  174  IN            INTEGER                               167  J         INTEGER
  162  JJ            INTEGER                               165  J1        INTEGER
  164  J2            INTEGER                                 0  M         INTEGER     ARRAY     F.P.
    0  V             INTEGER               F.P.            155  NN        INTEGER
  173  SDX           REAL                                  172  SVX       REAL
  161  SX            REAL                                  163  TI        REAL
  171  XB            REAL

FILE NAMES          MODE
      TAPE6         FMT

EXTERNALS            TYPE     ARGS
      SQRT           REAL       1 LIBRARY

STATEMENT LABELS
   25  10                                 0  20                                    121  24        FMT
  144  25       FMT                     152  25         FMT                        124  27        FMT
    0  30

STATISTICS
  PROGRAM LENGTH           2038     131
```

```
SUBROUTINE MEAN        74/74    OPT=1                          FTN 4.2+74355      01/31/77  11.46.10.      PAGE     1

                    SUBROUTINE MEAN
                    COMMON     M(10000),          IA(7),IB(7)
                    II=0
                    X=0
                    SX=0
                    N=10000
                    DO 10 I=1,N
                    IF(M(I).GT.1100.OR.M(I).LT.1)GO TO 11
                    X=X+M(I)
                    SX=SX+M(I)**2
                    GO TO 10
               11   M(I)=0
                    II=II+1
               10   CONTINUE
                    N=N-II
                    IF(N.EQ.0)N=1
                    XB =X/N
                    SVX=(N*SX-X**2)/(N*(N-1))
                    SDX=SQRT(SVX)
                    WRITE(6,15) X,XB,SDX
               15   FORMAT(1X,3(3X,F10.2))
                    RETURN
                    END

SUBROUTINE MEAN        74/74    OPT=1                          FTN 4.2+74355      01/31/77  11.46.10.      PAGE     2

    SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS
    1  MEAN

VARIABLES      SN  TYPE           RELOCATION
   44  I           INTEGER                          23427  IA       INTEGER    ARRAY   / /
23427  IB          INTEGER     ARRAY   / /             43  II       INTEGER
    0  M           INTEGER     ARRAY   / /             43  N        INTEGER
   47  SDX         REAL                                45  SVX      REAL
   42  SX          REAL                                41  X        REAL
   45  XB          REAL

EXTERNALS          TYPE    ARGS
      SQRT         REAL       1 LIBRARY

STATEMENT LABELS
   21  10                              20  11                               35  15      FMT  NO REFS

COMMON BLOCKS    LENGTH
   / /           10014

STATISTICS
   PROGRAM LENGTH                   50B      40
   CM BLANK COMMON LENGTH       234363B   10014
```

```
SUBROUTINE RADAR       74/74    OPT=1                          FTN 4.2+74355        01/31/77  11.46.11.      PAGE     1

                    SUBROUTINE RADAR
                    COMMON/BLOCK/ ICL,IZ,IB1,INC,ITL
                    COMMON     M(10000),               IA(7),IB(7)
                    J=1
                    I=1
                    IS=0
                 9  TI=M(I)+M(I+1)+M(I+IZ)+M(I+IB1)
                    XB=TI/ICL
                    IS=IS+1
                    WRITE(6,10) ICL,IS,TI,XB
                10  FORMAT(5X,2I10,2X,2F10.2)
                    J=J+INC
                    I=I+INC
                    JJ=IZ
                    IF(J.LT.JJ)GO TO 9
                    J=1
                    I=I+IB1+1
                    IF(I.GT.ITL) 11,9
                11  CONTINUE
                    RETURN
                    END

SUBROUTINE RADAR       74/74    OPT=1                          FTN 4.2+74355        01/31/77  11.46.11.      PAGE     2

SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS
    1   RADAR

VARIABLES      SN  TYPE           RELOCATION
   45   I          INTEGER                          23427  IA        INTEGER    ARRAY   / /
23427   IB         INTEGER     ARRAY    / /             2  IB1       INTEGER            BLOCK
    0   ICL        INTEGER              BLOCK           3  INC       INTEGER            BLOCK
   46   IS         INTEGER                              4  ITL       INTEGER            BLOCK
    1   IZ         INTEGER              BLOCK          44  J         INTEGER
   51   JJ         INTEGER                              0  M         INTEGER    ARRAY   / /
   47   TI         REAL                                53  XB        REAL

FILE NAMES       MODE
    TAPE6        FMT

STATEMENT LABELS
    5  9                        41  10        FMT                           0  11          INACTIVE

COMMON BLOCKS    LENGTH
    BLOCK             5
    / /           10014

STATISTICS
  PROGRAM LENGTH                 52B        42
  CM LABELED COMMON LENGTH        5B         5
  CM BLANK COMMON LENGTH     23436B      10014
```

```
SUBROUTINE UNPACK     74/74    OPT=1                          FTN 4.2+74355      01/31/77  11.46.14.       PAGE     1

                  SUBROUTINE UNPACK(M)
                  DIMENSION M(5,2000),MSK(5),IS(4)
                  DATA MSK/77770000000000000000B,7777000000000000B,777700000000B,
                1          77770000B,7777B/
                  DATA IS/12,24,36,48/
                  DO 2 J=1,2000
                  M(5,J)=M(1,J)
                  DO 1 I=1,4
                  M(I,J)=M(5,J).AND.MSK(I)
              1   M(I,J)=SHIFT(M(I,J),IS(I))
              2   M(5,J)=M(5,J).AND.MSK(5)
                  RETURN
                  END

SUBROUTINE UNPACK     74/74    OPT=1                          FTN 4.2+74355      01/31/77  11.46.14.       PAGE     2

   SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS
    3  UNPACK

VARIABLES       SN  TYPE              RELOCATION
   37  I            INTEGER                                43  IS       INTEGER    ARRAY
   36  J            INTEGER                                 0  M        INTEGER    ARRAY     F.P.
   40  MSK          INTEGER    ARRAY

INLINE FUNCTIONS    TYPE    ARGS
       SHIFT        NO TYPE    2  INTRIN

STATEMENT LABELS
    0  1                                      0  2

STATISTICS
  PROGRAM LENGTH           57B      47
```

```
SUBROUTINE IHMS        74/74    OPT=1                      FTN 4.2+74355      01/31/77  11.46.16.      PAGE    1

                  SUBROUTINE IHMS(TMS,IH,IM, SEC)
                  IH=TMS/3.6E6
                  IM=(TMS-IH*3.6E6)/60000
                  SEC =(TMS-IH*3.6E6-IM*60000)/1000
                  RETURN
                  END
```

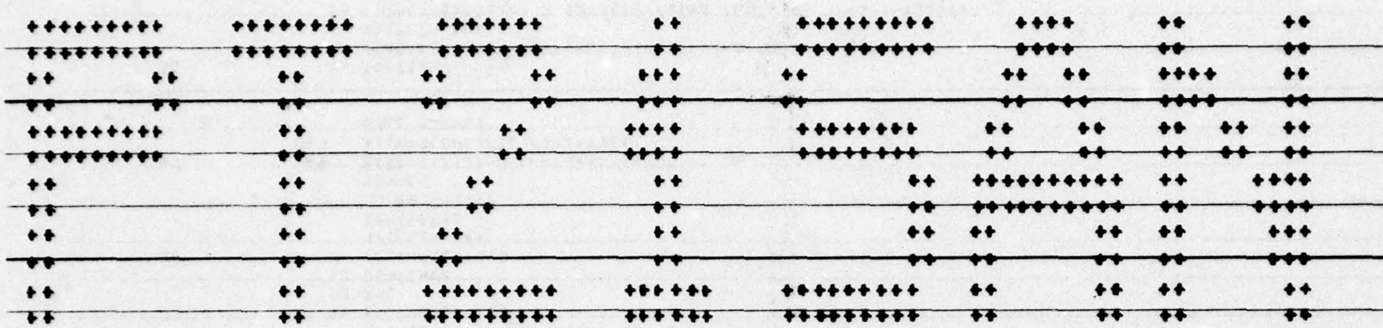
```
SUBROUTINE IHMS        74/74    OPT=1                      FTN 4.2+74355      01/31/77  11.46.16.      PAGE    2

  SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS
   3  IHMS

VARIABLES      SN  TYPE              RELOCATION
    0  IH          INTEGER              F.P.            0  IM      INTEGER            F.P.
    0  SEC         REAL                 F.P.            0  TMS     REAL               F.P.

STATISTICS
  PROGRAM LENGTH                     243      20
```

```
SUBROUTINE ELIM        74/74    OPT=1                      FTN 4.2+74355      01/31/77  11.46.17.      PAGE    1

                  SUBROUTINE ELIM(M,K)
                  DIMENSION M(10000)
                  COMMON/MVAL/MINVAL,MAXVAL,MINV,MAXV,NWDS
                  K=0
                  DO 10 J=1,10000
                  IF(M(J).LT.MINVAL)GO TO 10
                  IF(M(J).GT.MAXVAL)GO TO 10
                  K=K+1
                  M(K)=M(J)
                  IR=(J-1)/100+1
                  IC=J-100*(IR-1)
                  IR=SHIFT(IR,21)
                  IC=SHIFT(IC,12)
                  M(K)=IR.OR.IC.OR.M(K)
              10  CONTINUE
                  RETURN
                  END
```

```
SUBROUTINE ELIM        74/74   OPT=1                          FTN 4.2+74355        01/31/77  11.46.17.      PAGE    2

      SYMBOLIC REFERENCE MAP (R=1)

 ENTRY POINTS
    3  ELIM

 VARIABLES       SN  TYPE            RELOCATION
    43  IC           INTEGER                           42  IR          INTEGER
    41  J            INTEGER                            3  K           INTEGER                 F.P.
     0  N            INTEGER    ARRAY     F.P.          3  MAXV        INTEGER                 NVAL
     1  NAXVAL       INTEGER              NVAL          2  MINV        INTEGER                 NVAL
     0  NINVAL       INTEGER              NVAL          4  NNJS        INTEGER                 NVAL

 INLINE FUNCTIONS     TYPE      ARGS
        SHIFT         NO TYPE     2  INTRIN

 STATEMENT LABELS
    35  10

 COMMON BLOCKS   LENGTH
        NVAL         5

 STATISTICS
   PROGRAM LENGTH                  51B      41
   CM LABELED COMMON LENGTH         5B       5



      SORTF                                                   COMPASS 3.7+352.     01/31/77  11.46.20.      PAGE    1
      STORAGE ALLOCATION.

             ADDRESS    LENGTH                 BINARY CONTROL CARDS.

                   0        70                 IDENT      SORTF
                  70                           END

                                 ENTRY POINTS.

                                 SORTF              3+

                                 EXTERNAL SYMBOLS.

                                 TAPE20     TAPE30     SHCON7     CLSF.RM
```

```
SORTF                                                    COMPASS 3.7+352.     01/31/77  11.45.20.     PAGE     2

                                                  IDENT     SORTF
                                                  ENTRY     SORTF
                                                  EXT       TAPE20
                                                  EXT       TAPE30
      0  00000000000000000000      SORTF          DATA      0
      1  6110000001                               CLOSEM    TAPE20
      4  6110000001                               CLOSEM    TAPE30
      7  7110000012                               SX1       10
                  5150000006 X                    STORE     TAPE20,MRL=X1
     12  5150000006 X                             STORE     TAPE30,MRL=X1
            0100000000 X                          SORT
     15  55172024111716235555                     OPTIONS   VERIFY
     30  55550611140523555555                     FILES     (INPUT,TAPE20),(OUTPUT,TAPE30)
     35  55023124052311320555                     BYTESIZE  12
     41  55555513053155555555                     KEY       5,1,1,0,LOGICAL,DISPLAY,D
     53  6110000001                               CLOSEM    TAPE20
     55  6110000001                               CLOSEM    TAPE30
     61  5110000067 +                             SA1       VALIO
                  5150000001 X                    STORE     TAPE20,PD=X1
     64  5150000001 X                             STORE     TAPE30,PD=X1
            0400000000 +                          EQ        SORTF
     67  11461755555555555555      VALIO          DATA      10HI-O
     70                                           END

                 017000 CM  STORAGE USED              1107 STATEMENTS        197 SYMBOLS      000004 INVENTED SYMBOLS
                            MODE. 74 ASSEMBLY         2.118 SECONDS           55 REFERENCES


SORTF                                                    COMPASS 3.7+352.     01/31/77  11.45.20.     PAGE     3
SYMBOLIC REFERENCE TABLE.

CLSF.RM         0    EXTERNAL*      2/07      2/03      2/17      2/18
OPDRO*P         1                   2/12 D    2/13 D    2/14 D    2/14 D    2/14 D    2/15 D
SEQUFLAG        0                   2/12 D    2/13 D    2/14 D
SEQUSAVE        3                   2/14 D    2/14      2/14 D    2/14      2/16 D    2/16 D    2/16 D
SEQUSTDN        0                   2/15 D    2/15 D    2/16 D    2/16 D    2/16 D
                                    2/16      2/15      2/16      2/16      2/16
SM;OM7          0    EXTERNAL*      2/11
SORTF           0    PROGRAM*       2/02 E    2/05 L    2/21
TAPE20          0    EXTERNAL*      2/03 X    2/07      2/09      2/14      2/17      2/19
TAPE30          0    EXTERNAL*      2/04 X    2/03      2/10      2/14      2/18      2/20
VALIO          67    PROGRAM*       2/18      2/22 L
>MRL<           0                   2/09 D    2/11 D
>PD<            0                   2/19 D    2/21 D
```

Appendix C. LISTING FOR PROGRAM KPLOT



PT21SAN
PT21SAN
PT21SAN
PT21SAN
PT21SAN
PT21SAN
PT21SAN
PT21SAN
PT21SAN
PT21SAN
PT21SAN
PT21SAN

PROGRAM KPLOT 74/74 OPT=1 FTN 4.2+74355 01/31/77 15.41.52. PAGE 1

```
      PROGRAM KPLOT(INPUT,OUTPUT,TAPE5=INPUT,TAPE6=OUTPUT,TAPE7)
      DIMENSION P(50),Q(50),KSYM(10)
      COMMON /DAT/NP,X(200),Y(200),KR(200),KC(200),KV(200),VIEW(4),
     1IH,IM,SEC,MINV,MAXV,ISYM(200)
      COMMON/CALB/BIAS(8,8),SLOP(8,8)
      DATA KSYM/48,49,50,51,52,53,54,55,56,57/
      NP=10
      DO 73 I=6,8
      DO 73 J=2,8
      BIAS(I,J)=BIAS(5,J)
      SLOP(I,J)=SLOP(5,J)
   73 CONTINUE
    1 READ(7)    IH,IM,SEC,(VIEW(I),I=1,4)
      WRITE(6,2) IH,IM,SEC,(VIEW(I),I=1,4)
    2 FORMAT(2I3,F10.3,4A10)
      WRITE(6,3)
    3 FORMAT(1X*INPUT 0 TO SKIP BAR PLOT, OR MIN. VAL---(I3)*)
      READ(5,4) MINV
    4 FORMAT(I3)
      READ(7)    ((P(I),Q(I),I=1,50))  ,IFIL,IAP,IGN,RANGE
      IF(MINV.LE.0) GO TO 14
      VALM=MINV
      DELT=(P(50)-VALM)/10.
      DO 5 J=1,50
      K=J
      IF(P(J).GE.VALM) GO TO 8
    6 CONTINUE
    8 X(1)=VALM+DELT
      Y(1)=0.0
      DO 9 I=2,10
      Y(I)=0.0
    9 X(I)=X(I-1)+DELT
      DO 13 I=1,10
      DO 11 J=K,50
      L=J
      IF(P(J).GT.(X(I)+0.1)) GO TO 12
   11 Y(I)=Y(I)+Q(J)
   12 K=L
   13 CONTINUE
      DELT=DELT*0.5
      IFIL=IFIL+1
      IAP=IAP+1
      DO 49 I=1,10
      IGN=1
   49 X(I)=((X(I)-DELT)/IGN)*RANGE
C49   X(I)=SLOP(IFIL,IAP)*X(I)
      CALL BARPLT
C
C
   14 CONTINUE
      READ(7)    ((KR(I),KC(I),KV(I),I=1,200))
      WRITE(6,16)
   16 FORMAT(1X*INPUT 0 TO SKIP POINT PLOT, OR NPPS---(I3)*)
      READ(5,4) NP
      IF(NP.LE.0) GO TO 100
C
      DO 25 I=1,NP
```

```
      X(I)=KC(I)
      Y(I)=100-KR(I)+1
      IF(X(I).GE.100.) X(I)=99.9
      IF(Y(I).GE.100.) Y(I)=99.9
      J=(KV(I)-1)/100+1
      IF(J.LE.0) J=1
      IF(J.GT.10) J=10
   21 ISYM(I)=KSYM(J)
   25 CONTINUE
C
   26 CONTINUE
      MAXV=KV(1)
      MINV=KV(NP)
      CALL HSPOT
C
  100 CONTINUE
      WRITE(6,101)
  101 FORMAT(1X*INPUT ) TO STOP, OR 1 TO CONTINUE---(I3)*)
      READ(5,*) IGO
      IF(IGO.GT.0) GO TO 1
      STOP
      END
```

```
        PROGRAM KPLOT       74/74    OPT=1                                FTN 4.2+74355        01/31/77  15.41.52.       PAGE      3

      SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS
  6152  KPLOT

VARIABLES      SN  TYPE             RELOCATION
     0  BIAS       REAL       ARRAY   CALB              6517  DELT        REAL
  6510  I          INTEGER                              6513  IAP         INTEGER
  6512  IFIL       INTEGER                              6514  IGN         INTEGER
  6522  IGO        INTEGER                              1755  I4          INTEGER                DAT
  1756  IN         INTEGER            DAT               1762  ISVN        INTEGER      ARRAY     DAT
  6511  J          INTEGER                              6520  K           INTEGER
  1131  KC         INTEGER    ARRAY   DAT                621  KK          INTEGER      ARRAY     DAT
  6667  KSFN       INTEGER    ARRAY                     1441  KV          INTEGER      ARRAY     DAT
  6521  L          INTEGER                              1761  MAXV        INTEGER                DAT
  1760  MINV       INTEGER            DAT                  0  NP          INTEGER                DAT
  6523  P          REAL       ARRAY                     6605  Q           REAL         ARRAY
  6515  RANGE      REAL                                 1757  SEC         REAL                   DAT
   100  SLOP       REAL       ARRAY   CALB              6516  VALN        REAL
  1751  VIEW       REAL       ARRAY   DAT                  1  X           REAL         ARRAY     DAT
   311  Y          REAL       ARRAY   DAT

FILE NAMES           MODE
     0  INPUT                  2041  OUTPUT                           0  TAPE5      FMT             2041  TAPE6      FMT
  4102  TAPE7        UNFMT

EXTERNALS             TYPE    ARGS
        BARPLT                  0                            HSPOT           0

STATEMENT LABELS
  6165  1                                    6400  2         FMT                          6406   3        FMT
  6422  4          FMT                          0  6                                      6226   8
     0  9                                       0  11                                     6294   12
     0  13                                   6274  14                                     6452   16       FMT
     0  21            INACTIVE                  0  25                                        0   26           INACTIVE
     0  49                                      0  73                                     6352   100
  6470  101        FMT

COMMON BLOCKS     LENGTH
        DAT        1210
        CALB        128

STATISTICS
  PROGRAM LENGTH                 5368B      350
  BUFFER LENGTH                 61438B     3171
  CM LABELED COMMON LENGTH      24728B     1338
```

```
      BLOCK DATA ONE
      COMMON/CALB/BIAS(8,8),SLOP(8,8)
      DATA BIAS(1,1)/-.214539285714 3E-3/,SLOP(1,1)/.3633314732143E-5/
      DATA BIAS(1,2)/-.225882317073 2E-3/,SLOP(1,2)/.4962576219512E-5/
      DATA BIAS(1,3)/-.231763888888 9E-3/,SLOP(1,3)/.7535763888889E-5/
      DATA BIAS(1,4)/-.271954560721 1E-3/,SLOP(1,4)/.1226907909440E-4/
      DATA BIAS(1,5)/-.231982589928 0E-3/,SLOP(1,5)/.2153298561151E-4/
      DATA BIAS(1,6)/-.559247093468 8E-2/,SLOP(1,6)/.6917665604054E-4/
      DATA BIAS(1,7)/-.535466022250 4E-2/,SLOP(1,7)/.1405129421072E-3/
      DATA BIAS(1,8)/-.112973250685 0E-2/,SLOP(1,8)/.2938087220988E-3/
      DATA BIAS(2,1)/-.722201721487 5E-2/,SLOP(2,1)/.1273840208068E-4/
      DATA BIAS(2,2)/-.823472497707 4E-2/,SLOP(2,2)/.2083929862126E-4/
      DATA BIAS(2,3)/-.526210034557 4E-2/,SLOP(2,3)/.3163894161029E-4/
      DATA BIAS(2,4)/-.883707337714 9E-2/,SLOP(2,4)/.4475679816032E-4/
      DATA BIAS(2,5)/-.159356716313 3E-2/,SLOP(2,5)/.1034158227242E-3/
      DATA BIAS(2,6)/-.225833692307 7E-2/,SLOP(2,6)/.1900769230769E-3/
      DATA BIAS(2,7)/-.714404503331 5E-2/,SLOP(2,7)/.4628852075858E-3/
      DATA BIAS(3,1)/-.696392742616 0E-4/,SLOP(3,1)/.7221426160338E-5/
      DATA BIAS(3,2)/-.624178481012 9E-4/,SLOP(3,2)/.1083213924051E-4/
      DATA BIAS(3,3)/-.320030460992 9E-3/,SLOP(3,3)/.1331328014184E-4/
      DATA BIAS(3,4)/-.210216937271 5E-2/,SLOP(3,4)/.3046522706827E-4/
      DATA BIAS(3,5)/-.166863949355 9E-2/,SLOP(3,5)/.6333394191373E-4/
      DATA BIAS(3,6)/-.421069060192 7E-2/,SLOP(3,6)/.1226116076048E-3/
      DATA BIAS(3,7)/-.479916074031 1E-2/,SLOP(3,7)/.2589986824960E-3/
      DATA BIAS(3,8)/-.876851564275 1E-2/,SLOP(3,8)/.5445672101830E-3/
      DATA BIAS(4,1)/-.662795327103 6E-4/,SLOP(4,1)/.5951168224299E-5/
      DATA BIAS(4,2)/-.169582830188 7E-3/,SLOP(4,2)/.9611698113208E-5/
      DATA BIAS(4,3)/-.654820922690 0E-4/,SLOP(4,3)/.1296605299910E-4/
      DATA BIAS(4,4)/-.712989608537 6E-4/,SLOP(4,4)/.1844246496422E-4/
      DATA BIAS(4,5)/-.463542202132 5E-2/,SLOP(4,5)/.6356937032200E-4/
      DATA BIAS(4,6)/-.426739087695 6E-2/,SLOP(4,6)/.1117857060701E-3/
      DATA BIAS(4,7)/-.660452751620 8E-2/,SLOP(4,7)/.2417003186988E-3/
      DATA BIAS(4,8)/-.137683547181 8E-1/,SLOP(4,8)/.5181995250158E-3/
      DATA BIAS(5,2)/-.146839148488 8E-3/,SLOP(5,2)/.3050586070959E-5/
      DATA BIAS(5,3)/-.200612497041 4E-3/,SLOP(5,3)/.4578887573964E-5/
      DATA BIAS(5,4)/-.499541132075 3E-4/,SLOP(5,4)/.7300301886792E-5/
      DATA BIAS(5,5)/-.155306518851 4E-3/,SLOP(5,5)/.1358704507513E-4/
      DATA BIAS(5,6)/-.737929801324 4E-3/,SLOP(5,6)/.2694913907285E-4/
      DATA BIAS(5,7)/-.204916313405 7E-2/,SLOP(5,7)/.6457466674298E-4/
      DATA BIAS(5,8)/-.127332094645 5E-1/,SLOP(5,8)/.1740055439812E-3/
      END
```

```
BLOCK DATA ONE          74/74    OPT=1                        FTN 4.2+74355        01/31/77  15.41.55.        PAGE     2

          SYMBOLIC REFERENCE MAP (R=1)

VARIABLES       SN  TYPE              RELOCATION
     0 BIAS         REAL         ARRAY    CALB              100  SLOP        REAL        ARRAY    CALB

COMMON BLOCKS     LENGTH
          CALB       128

STATISTICS
  PROGRAM LENGTH                    0B         0
  CM LABELED COMMON LENGTH        200B       128
```

```
      SUBROUTINE BARPLT
      DIMENSION IVSTR(4),IHSTR(4)
      COMMON /DAT/NP,X(200),Y(200),KR(200),KC(200),KV(200),VIEW(4),
     1IH,IM,SEC,MINV,MAXV,ISYM(200)
      DATA IWBAR,IDBAR/10,10/
      DATA IVSTR/78,83,84,83/
      CALL INITT(0)
      CALL TERM(3,1024)
      CALL   BINITT
      CALL PGWAIT(0)
      CALL   NPTS(10)
      XMAX=-100000.
      YMAX=-100000.
      XMIN= 100000.
      YMIN= 100000.
      CALL MNMX(X,XMIN,XMAX)
      CALL MNMX(Y,YMIN,YMAX)
      CALL DLIMX(XMIN,XMAX)
      CALL DLIMY(YMIN,YMAX)
      CALL    XFRM(1)
      CALL CHRSIZ(1)
      CALL    VBARST(1,IWBAR,IDBAR)
      CALL    CHECK(X,Y)
      CALL    DSPLAY(X,Y)
      CALL    MOVABS(150,760)
      CALL    ANMODE
    5 FORMAT(1X*TIME=*I2,I2,F6.3,4I10)
      WRITE(6,5) IH,IM,SEC,(VIEW(I),I=1,4)
C     CALL MOVABS(150,30)
      CALL MOVABS(500,30)
      CALL ANMODE
C     WRITE(6,6)
    6 FORMAT(1X*W/SR.24..2*)
      WRITE(6,4)
    4 FORMAT(4X,*CNT*)
      CALL MOVABS( 50,500)
      CALL ANMODE
      CALL VLABEL(4,IVSTR)
      CALL BELL
      CALL TINPUT(I)
      CALL ERASE
      CALL HOME
      RETURN
      END
```

```
SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS
     1  BARPLT

VARIABLES      SN  TYPE           RELOCATION
   202  I          INTEGER                                  134  IOBAR    INTEGER
  1755  I4         INTEGER                 DAT              20P  INSTR    INTEGER   *UNDEF
  1756  IN         INTEGER                 DAT             1762  ISYN     INTEGER   ARRAY    DAT
   203  IVSTR      INTEGER      ARRAY                       133  I4BAR    INTEGER
  1131  KC         INTEGER      ARRAY      DAT              521  KR       INTEGER   ARRAY    DAT
  1441  KV         INTEGER      ARRAY      DAT             1761  MAXV     INTEGER            DAT
  1760  MINV       INTEGER                 DAT                0  NP       INTEGER            DAT
  1757  SEC        REAL                    DAT             1751  VIEW     REAL      ARRAY    DAT
     1  X          REAL         ARRAY      DAT              175  XMAX     REAL
   200  XMIN       REAL                                     311  Y        REAL      ARRAY    DAT
   177  YMAX       REAL                                     201  YMIN     REAL

FILE NAMES          MODE
     TAPE5          FMT

EXTERNALS           TYPE   ARGS
       ANMODE               0                   BELL        0
       BINITT               0                   CHECK       2
       CHRSIZ               1                   DLINX       2
       DLINY                2                   DSPLAY      2
       ERASE                0                   HOME        0
       INITT                1                   MNMX        3
       MOVABS               2                   NPTS        1
       PGWAIT               1                   TERM        2
       TINPUT               1                   VBARST      3
       VLABEL               2                   XFRM        1

STATEMENT LABELS
   156  4        FMT                   135  5        FMT                        150  6        FMT  NO REFS

COMMON BLOCKS    LENGTH
       DAT         1210

STATISTICS
   PROGRAM LENGTH                213B      139
   CM LABELED COMMON LENGTH    2272B     1210
```

```
      SUBROUTINE HSPOT
      DIMENSION A(2),B(2)
      COMMON /DAT/NP,X(200),Y(200),KR(200),KC(200),KV(200),VIEW(4),
     1IH,IM,SEC,MINV,MAXV,ISYM(200)
      DATA A,B/0.0,100.0,0.0,100.0/
      CALL INITT(0)
      CALL TERM(3,1024)
      CALL BINITT
      CALL PGWAIT(0)
      CALL DLIMX(A(1),A(2))
      CALL DLIMY(B(1),B(2))
      CALL NPTS(2)
      CALL LINE(-1)
      CALL CHECK(A,B)
      CALL DSPLAY(A,B)
      CALL    MOVABS(150,760)
      CALL    ANMODE
      WRITE(6,5) IH,IM,SEC,(VIEW(I),I=1,4)
    5 FORMAT(1X*TIME=*I2,I2,F6.3,4A10)
C     CALL MOVABS(150,750)
C     CALL ANMODE
C     WRITE(6,6) MINV,MAXV
    6 FORMAT(1X*MIN=*I4,*   MAX=*I4)
      CALL SIZES(0.2)
      CALL CHRSIZ(4)
      DO 11 I=1,NP
      DO 3 J=1,I
      IF(ABS(Y(I)-Y(J)).GT.1.3) GO TO 3
      IF(ISYM(J).NE.0) GO TO 3
      IF(X(I).EQ.X(J)) GO TO 11
    3 CONTINUE
      CALL MOVEA(X(I),Y(I))
   10 CALL HLABEL(1,ISYM(I))
      ISYM(I)=0
   11 CONTINUE
      CALL BELL
      CALL TINPUT(I)
      CALL ERASE
      CALL HOME
      RETURN
      END
```

```
      SUBROUTINE HSPOT       74/74    OPT=1                          FTN 4.2+74355       01/31/77  15.41.59.        PAGE      2

      SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS
   1  HSPOT

VARIABLES       SN  TYPE            RELOCATION
  176  A            REAL        ARRAY                    176  B          REAL       ARRAY
  172  I            INTEGER                             1755  I4         INTEGER              DAT
 1756  IN           INTEGER              DAT            1762  ISYM       INTEGER    ARRAY     DAT
  173  J            INTEGER                             1131  KC         INTEGER    ARRAY     DAT
  521  KR           INTEGER     ARRAY    DAT            1441  KV         INTEGER    ARRAY     DAT
 1761  MAXV         INTEGER              DAT            1760  MINV       INTEGER              DAT
    0  NP           INTEGER              DAT            1757  SEC        REAL                 DAT
 1751  VIEW         REAL        ARRAY    DAT               1  X          REAL       ARRAY     DAT
  311  Y            REAL        ARRAY    DAT

FILE NAMES          MODE
      TAPE5         FMT

EXTERNALS             TYPE    ARGS
      ANMODE                   0                         BELL                       0
      BINITT                   0                         CHECK                      2
      CHRSIZ                   1                         DLIMX                      2
      DLIMV                    2                         DSPLAY                     2
      ERASE                    0                         HLABEL                     2
      HOME                     0                         INITT                      1
      LINE                     1                         MOVABS                     2
      MOVEA                    2                         NPTS                       1
      PGWAIT                   1                         SIZES                      1
      TERM                     2                         TINPUT                     1

INLINE FUNCTIONS      TYPE    ARGS
      ABS           REAL       1  INTRIN

STATEMENT LABELS
   53  3                                    150  5        FMT                       154  6        FMT  NO REFS
    0  10             INACTIVE               66  11

COMMON BLOCKS   LENGTH
      DAT         1210

STATISTICS
   PROGRAM LENGTH                 200B       128
   CM LABELED COMMON LENGTH     2272B       1210
```

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